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GERIATRICS

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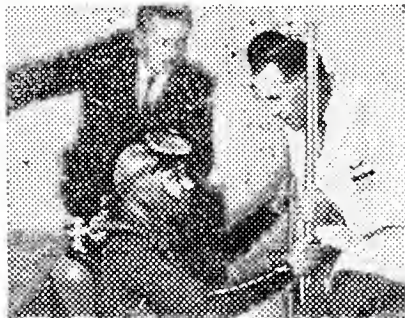
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Guest Editorial

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Geriatrics

"Geriatrics" refers to the medical treatment of old age and its diseases. In the practice of geriatrics it is realized that to treat the elderly, the physician must take into account the individual's environment and his reaction to his environment. In other words geriatrics now embraces social and economic factors as well as psychological and psychiatric aspects. Originally gerontology was the study of the aging process in the biological sense. However, in recent years it has expanded into the social and behavioral sciences. The care of the elderly rests primarily with the physician, either the family physician or the internist. The physician has a responsibility to keep a well individual well and to deal with disease when it occurs. He should see that disabilities are prevented as far as possible and when they occur, to treat to the best of his ability. After illnesses he should attempt to restore the individual to maximum function. At times he needs the help of other medical and surgical specialists, psychiatrist, clinical psychologist, nurse, dentist, physiotherapist, occupational therapist and speech therapist. He would do well to keep abreast of the advances in the field of social sciences. Recreational centres are useful in health maintenance.

Frequently the physician cannot aim for a cure as much as he can aim for preserving and improving physical and mental efficiency, by symptomatic treatment and special aids. A good doctor treats his elderly patients with purpose and hope. Most of the elderly live in the community. Only 5% are in institutions. The aim is to help the elderly to function in the community with reasonable independence despite ailments and disabilities.

You may wonder why the problem of the elderly has come into such sharp focus in the past 25 years. Medically this is due to the fact that with the improved mortality in the younger age groups, more people are living to the age when the diseases associated with aging become manifest. There are certain social and economic factors. With the introduction of medical insurance and now medicare, these older individuals are receiving more medical care. Our changing pattern of housing to single family dwellings and in many cases with both husband and wife going to business, precludes often the care of these elderly individuals by their own family.

At a recent board meeting of the American Geriatrics Society, the President-elect Dr. Irving Wright of New York City, showed concern regarding the lack of compassion for old people in some areas of medical practice. He would like to create the image of a doctor working with the elderly as the "compassionate physician". In a recent talk by Dr. Alfred H. Lawton on "Continuing Post Graduate Medical Education in Geriatrics"¹ he made certain pertinent observations. He stated that it was alleged that youth does not like to deal with incurable disease, to associate with the aged, or to treat the dying, as it forces him to confront the fact of his own mortality. Slowly progressive, chronic and incurable diseases in the late stages of aging and senility are avoided by the professor and the student alike. We must not forget

who these people are, for whose welfare we are showing concern. They are our parents and grandparents who made it possible for us to have the standard of living we have to-day. They made more progress with their diligence than has ever been accomplished in a previous era. One day we shall be counted among them and we hope that our children and grandchildren will have reason to be as proud of us. We must help the elderly to sustain a sense of worth and dignity and to function as efficiently and as long as possible in the community. With the proper genetic background and environment, it is possible to live to a ripe old age in perfect physical and mental health.

The more prevalent diseases of the aged are cardiac, cerebral and arterial diseases, mental and nervous disorders, cancer, diseases of joints, pulmonary diseases such as emphysema, chronic bronchitis and asthma, and prostatic disease and urinary incontinence. However, the major disabilities encountered in the elderly are: (1) mental and emotional disturbances (2) impairment of locomotion (3) deafness (4) impaired sight. It should not be forgotten that old age does not prevent a person from developing almost any disease. Diseases are frequently multiple in the elderly. In older people there is a tendency for signs and symptoms of disease to be minimal. With modern surgery and anaesthesia, the older individual is not excluded from needed surgery. Post-operative infection, particularly in the lungs, and thromboembolism are the greatest risks. In fact older people have an increased susceptibility to pneumonia. It is not clear whether this is due to a decreased resistance to infection, a poor immune mechanism or deficient respiratory function. Older people do not stand stress well. This is exemplified in the high percentage of altered glucose tolerance curves in the elderly and their poor adaptability to extremes of heat or cold.

As stated previously, the key word in the treatment of the elderly is "function". Activation and the re-activation (rehabilitation) should begin early in any illness. The elderly person soon deteriorates physically, mentally and emotionally if this principle is not observed. A physician should always consider the psychological, social and economic factors in relation to his patient's physical condition. Mental change may be associated with the physical condition. In fact, in well over 50% of cases, the mental change is due in part at least to the physical state. Before labelling mental change as chronic brain syndrome or senility, possible physical basis should be sought.

In the practice of geriatrics, the physician-patient relationship is all-important. To the patient the physician is frequently an authoritative figure. The physician must convince the patient that he is interested in his well being. We consider that regular medical check-ups are very important in early detection and treatment of disease in the elderly. Good foot care and instructions of how to prevent trouble is essential. Regular exercise within the limits of tolerance should be encouraged. Frequently insomnia is due to anxiety or emotional disturbances and these should be sought for instead of prescribing hypnotics. At times the question of habits such as smoking arises with the elderly. There are certain specific conditions such as peripheral vascular disease, chronic bronchitis and emphysema in which it is advisable for the individual to stop smoking. However, under other conditions, moderate smoking in an individual who has smoked for many years may be less harmful than the emotional disturbance created by trying to stop.

In treating elderly individuals we have to consider their old age as well as their diseases and disabilities. One theory of growing old is that it consists of a continuous process of involution, not at the same rate in each individual, or at the same rate in various systems of the same individual. It is considered that heredity may be a most important factor. Environment and disease influence aging tremendously. Environment includes race, climate, over-work, poverty, anxiety and diet with lack of protein or too many calories. Disease processes, particularly degenerative diseases, increase with age. Physiological aging shades almost imperceptibly into the pathological. If physiological aging is the sole cause of death in an individual, it must be extremely rare. Life expectancy has altered little in recent years beyond the age of 60, because of a lack of breakthrough in the cause and prevention of arteriosclerosis and cancer. Heredity influences many diseases associated with aging — atherosclerosis, high blood pressure, diabetes, emphysema, certain forms of deafness, some mental impairment and degenerative diseases.

A society that has contributed to the advancement of medical science resulting in an increasing number of persons reaching the older age group, can hardly escape the responsibility created by such a situation. We must treat these people to the best of our ability with our present knowledge. It is also essential that encouragement be given to research in the vast field of degenerative diseases, in which so little progress has been made. We would like to see a breakthrough in the cause and prevention of degenerative diseases. However with our present symptomatic and supportive treatment, our main aims are not so much to have these old folks live longer with their afflictions, but to make them happier and ease their own burdens as well as the burden on society.

Geriatrics In Ontario

William W. Priddle, B.A., M.D.

Geriatric Study Centre

350 Christie Street, Toronto 176, Ontario

In Ontario two departments of the government — the Department of Health and the Department of Social and Family Services — are responsible for the care of the aged. Under the Department of Health the Ontario Hospital Services Commission and the Ontario Health Services Insurance Plan have relieved to a considerable degree the economic burden of illness among our elderly. Ontario also has a very successful Home Care program which was started 12 years ago. The service provides for treatment and maintenance of health.

Under the Department of Social and Family Services the care of the elderly is the responsibility of the Homes for the Aged Branch and the Office on Aging and operates under the Homes for the Aged and Rest Home Act and the Charitable Institution Act. There are 164 Homes for the Aged in Ontario, most of them relatively new and they care for about 20,000 residents in Ontario. There is, also, a Foster Home program for elderly persons lodged in private homes, arranged through the local Homes for the Aged. Eighteen day care or senior citizens' recreation centres now operate in Ontario.

During the past 15 or 20 years the Department of Social and Family Services (formerly Public Welfare) mainly in the Homes for the Aged Branch, has developed a very exciting program — health care and maintenance, and research as related to the aged.

In 1953 the Minister of Public Welfare appointed a consultant in geriatrics. Encouraged by more liberal grants, many municipalities had modernized or built a new Home for the Aged with facilities for special care, and bed care as well as ambulatory care. Thus indirectly the provincial department was responsible for a number of mentally or physically disabled old people, and they felt a need for some medical guidance. After reviewing the situation throughout the province, the consultant made certain recommendations. In addition to the full time Home physician, he advised the appointment of three doctors to serve Lambert Lodge on a part-time basis. One physician was appointed to take charge of annual examinations and research. Another took over the duties of officer in charge of recreation, reactivation and physical medicine. The third assumed the position of psychiatric consultant and adviser. To these wise and devoted physicians we owe a great deal as they became pioneers in their respective fields of aging. Their work was directly responsible for the recommendations that a Centre be set up at Lambert Lodge for geriatric teaching and research to benefit the whole province and indeed the whole world.

By an order-in-council approved by His Honour the Lieut. Governor, on the 4th of September, 1958, a Minister's Advisory Committee on Geriatric Studies was appointed. "The said Committee to advise the Minister of Public Welfare generally, on all matters related to

geriatrics and without restricting the generality of the foregoing, (1) to assure a high standard of medical care for geriatric patients with special reference to Homes for the Aged; (2) to study methods of prevention of deterioration and improve the physical, mental and emotional fitness of elderly people and (3) to study cause, prevention and treatment of the diseases associated with the process of aging". As a result of their recommendations the Geriatric Study Centre was established at 350 Christie Street, and the Acute Geriatric Ward at Toronto Western Hospital. These two pilot projects have proven extremely successful and have received wide recognition for their conception and proven worth in geriatric research.

The Geriatric Study Centre was manned by a director, nurses, secretaries and full-time and voluntary assistants. The activities were conducted on a clinic-like basis. Top ranking consultants came to the clinic and conducted consultations on the residents referred by the physicians to the various Homes for the Aged. This material was used for studies in the field of aging. The Geriatric Study Centre is unique in that I know of no similar institution in existence. The Acute Geriatric Ward at Toronto Western Hospital is similarly original in its conception. Here all the acutely ill patients from Homes for the Aged and Charitable institutions of Metro Toronto come for treatment. Their beds in the Homes are saved for them, and as soon as they are able they are transferred back to their original Home. This allows for quick turnover and prevention of deterioration of their program in the Home for the Aged. Success of these two projects led to the Select Committee of the Legislature in their final recommendations in 1967 recommending that all hospitals of sufficient size that warrant it, have a geriatric ward as well as a geriatric section in the out-patients' department. The Minister's Advisory Committee has repeatedly emphasized the need by recommending that further acute geriatric wards be established in Metro Toronto, preferably teaching hospitals and that similar wards be established in larger hospitals throughout the province and that preference be given to university affiliation.

In the meantime, a geriatric section of the Ontario Medical Association had been established and has gradually developed into one of the stronger sections of the Association.

The studies on hypertension have been among the major research projects at the Geriatric Study Centre since its inception in 1960. This work has been mainly supported by government — provincial and municipal — and voluntary workers. The most recent report on this work was published in the Journal of the American Geriatrics Society in November, 1970. However, the main financial support of Fellows for geriatric research has come through the Ontario Geriatrics Research So-

ciety. In their charter the terms of reference are "to engage in medical research and in particular without limiting the generality of the foregoing, to study and carry on research in the causes and prevention of diseases and problems associated with aging". Their main purpose has always been to support Fellows to do research in the field of aging on projects recommended to them by their Medical Advisory Board. I shall list a few of the representative projects that have been completed.

The first fellowship was a student Fellow working under Professor Hobbs at the University of Western Ontario on a project entitled "A Comparative Study of Elderly Mental Hospital Patients and Residents of Homes for the Aged". The Society supported Edgar Love completely in his work.

Perhaps one of the finest efforts of the Society was the support of a fellowship for Miss Amy de Brisay, an occupational therapist who had wide experience with the elderly. With the help of others she set about to study methods of reactivating stroke victims who had lost their power of communication (expression and reception of speech, writing, etc.). The project was highly imaginative and successful. As a result of her communication studies a course was set up for personnel of nurses' aide level from Homes for the Aged and Charitable Institutions to train them in Miss deBrisay's methods. These adjuvants have been of great help when they returned to their duties. The classes have been highly successful and have been continued. The Homes for the Aged Branch was so impressed by the value of their work that they have asked for more and larger classes and recently appointed a full time supervisor of adjuvants. This work of Miss deBrisay's has been fully supported through the years by the Ontario Geriatrics Research Society. For the first six years, funds were obtained from the Loblaw Charitable Fund. Since then she has been supported by the general fund of the Society. Since her retirement, the Geriatrics Research Society has obtained funds from the Associated Medical Services to support another occupational therapist to continue her studies.

A published study entitled "The Prevalence of Chronic Obstructive Bronchopulmonary Disease in Very Old People" was accomplished by Dr. G. Aguzzi working with Dr. C. R. Woolf and Dr. John F. Paterson. The total fellowship fund to support Dr. Aguzzi was obtained from the Bickell Foundation by the Ontario Geriatrics Research Society.

Since the year 1966-67 the Society has fully supported research Fellows working under Dr. Murray Wiley in the Orthopaedic Department of the Toronto Western Hospital. The results of this work resulted in a major publication in the *Journal of Bone and Joint Surgery*, May, 1970, entitled "Venous Thrombosis in Patients with Fracture of the Upper End of the Femur — a Phlebographic Study of the Effect of Prophylactic Anti-coagulation".

This year the Society has approved two further projects under Dr. Wiley and has allotted funds for research. The first project is being accomplished at the engineering department of the University of Waterloo in collaboration with Dr. Wiley on a production of better type of material for hip joint prosthesis. The second project is to fully support a research Fellow under Dr. Wiley to work on the transplanting of cartilage in joints. Some of the experimental work has already been completed and the whole project is very exciting and promising.

During the year 1969, the Society made a sizeable grant-in-aid for research on aging of retinal blood vessels by Dr. Sibay working under the direction of Dr. Hans R. Hausler. In a letter from Professor Clement McCulloch he states "As you know there is no obvious and simple cure for retinal vascular degeneration in aging. However, we have come a long way, particularly in recent years, and we are now well aware that the blood supply to the capillaries, viability of the capillaries, the degeneration changes and the death of retinal cells are the key areas in the loss of vision with aging. We are very grateful for your assistance. I think it has been an aid to us in understanding the patients and it is likely to bear fruit to better the health of patients with retinal vascular diseases in aging."

Perhaps you wonder what the old folks think of all these studies. It has been our experience that they like the attention and the feeling that their individual case is interesting enough to be followed and that they are contributing. However, the researcher and his assistants must be completely honest with the older patient. He has to be informed, treated as an individual, an important individual. The Minister's Advisory Committee on Geriatric Studies has always insisted that residents of Homes for the Aged must in no way be treated as 'guinea pigs', in fact they will not allow any drugs or method of treatment to be used that is not approved for general use. Even drugs that are approved for clinical trial cannot be used for these studies. As a result we hope we shall always maintain the confidence of the residents.

The Minister of Social and Family Services announced in the legislature April 28th, 1970, a proposed new geriatric complex on the Christie Street site. Besides a new Home for the Aged, this will include a new Geriatric Study Centre, a Day Care Centre and — it is hoped — nearby elderly persons housing.

In 1962 the Minister's Advisory Committee recommended the establishment of a library in connection with the Geriatric Study Centre to be called the J. W. Crane Memorial Library (geriatrics). This library has always held an interest for the board of the Ontario Geriatrics Research Society because of its potential importance to their research efforts. From time to time members of the Society made substantial private gifts of books in the field of geriatrics and gerontology.

However, with the proposed new complex the Society undertook to update the library. As a result, the International Business Machine Company through its president and one of the Society's board members — Mr. J. E. Brent — has taken care of this year's budget for books and journals. Money has been allotted by the Department of Social and Family Services to obtain a qualified research librarian. During the past year the Ontario Geriatrics Research Society has received donations from fourteen contributors including a substantial endowment by Colonel R. S. McLaughlin of Oshawa. It is predicted that we shall have a geriatrics research library second to none in the continent when the project is completed.

Only approximately 5% of individuals over 65 years of age are in institutions. The Homes for the Aged Branch under the Homes for the Aged and Rest Home Act supplies three types of Homes (1) municipal Homes (2) Charitable Institutions and (3) Rest Homes. Besides financial aid, the Department supplies extensive supervisory help. Those individuals who live in their own home, if they need help, can obtain excellent services from agencies such as the Victorian Order of Nurses, St. Elizabeth Order of Nurses and the Visiting homemakers. If the individual is unable to pay for the services, the province and municipality share the cost.

In summary, it is considered that the province of Ontario in many respects is recognized as a leader in the care of the elderly. The field of geriatrics which properly includes the physical, mental and emotional care of older people has outstanding examples of the advances made during the past fifteen years — pilot projects such as the Geriatric Study Centre and the Acute Geriatric Ward at the Toronto Western Hospital, the Ontario Geriatrics Research Society, the J. W. Crane Memorial Library (geriatrics), research in the loss and partial restoration of communication in stroke victims and the training of adjuvants to assist the elderly in reactivation to their maximum physical and mental capacity are a few of the unique and progressive developments in research and care of the elderly in Ontario.

- (1) Lawton, A. H.: *Gerontologist*, 10 (No. 3 — Part I): Autumn 1970.

References to accomplished and published work under the auspices of the Minister's Advisory Committee on Geriatric Studies and the Ontario Geriatrics Research Society are obtainable from the J. W. Crane Memorial Library, Geriatric Study Centre, 350 Christie Street, Toronto.

Old Age And Dying

Michael I. Pascoe, 711

INTRODUCTION

Science and Medicine are continuously on the march. As man gains better understanding of human biology, medicine utilizes some of the knowledge to modify physiological processes, to improve the quality of living and sometimes to sustain and extend life. Caring for the geriatric patient has become increasingly more relevant to the doctor. Today, no one has yet been able to prevent the normal aging process of the brain cells and hardening of the cerebral arteries. Nor can one immunize the psyche from the losses that old age brings: loss of loved ones, loss of vocation, of physical abilities or loss of feelings of usefulness. The prospect of imminent death is also often a harrowing experience. Thus while many of us revel at the joys of spritful youth, we should also consider the problems of aging and dying. Thirty years from now these will be our personal problems.

I. AGING

To consider the mental changes in the elderly person, one can think in terms of the following categories:

A. Normal Mental and Emotional Changes

B. Organic Changes

1. Dementia
2. Focal Lesions
3. Acute Toxic States

C. Psychiatric Changes

1. Affective Disorders
2. Schizophrenia

It is important to realize that these can overlap so that the effects of 2 or possibly all 3 of these categories can be playing a role in the behaviour of the elderly patient. It is equally important to differentiate them since, for example, depression can often be treated, while dementia is irreversible and some emotional changes are common to all, and must be accepted as such. It is the purpose of this article to differentiate these different areas and provide a basis for understanding and possibly treating the geriatric patient so that we as doctors can "add life to his years as well as years to his life."

A. Normal Mental and Emotional Changes

To appreciate the emotional and personality changes of the elderly, it is essential to realize that they are all individuals who just happen to be old. Like people of all ages, they need affection, to feel wanted and to be of use to others and yet at the same time to feel independent and to have a sense of security which comes from sufficient food, warmth and shelter. It is just harder in old age to satisfy these needs. However, there is often an apparent exaggeration of personal characteristics and the

older person may become a caricature of his former self. That is, while an adult learns to mask his true feelings in order to make himself socially acceptable, in old age these inhibitions may break down so that a person reveals more of his true self than he did in earlier life. For example, he may find it harder to guard his tongue and to control his actions; he may become more self-centred, petty, cantankerous or suspicious and he may become increasingly close with his money. Also, many older people become blunted in their emotions and have no strong feelings of joy or sorrow and that is why bereavement seems to cause less overt distress to the old than to the young.

It has been observed that the elderly react more slowly to new situations and that their performances in all types of intelligent tests except those concerned with meanings of words is below what it would have been in earlier life. It is felt that this "slowing up" is due to the fact that old people take longer to perceive what they should do in any given situation; on the other hand, once they have learned what is required, they are often able to make up by experience and reliability what they may lack in speed and dexterity. However, as it will be discussed below, there is often some degree of intellectual decline and the elderly often learn to react by avoiding those tasks which impose an intolerable strain on their brain power by replacing cerebral activity by inappropriate motor responses, such as scratching the head, coughing, or losing their temper. This response can take dramatic form with widespread anatomical manifestations, verbal tirade, tears, or total silence.

Often relatives discourage reminiscing by the elderly thinking it is a sign of deterioration; however, it has been found¹ that this tendency is not directly related to either intelligence or intellectual deterioration and is moreover positively correlated with successful adaptation to old age. Why does one reminisce? Decreasing gratification in the present and the awareness of failing capabilities contribute to what has been described in the aged as the process of disengagement² or a tearing away from the present. The resultant lack of interest and avoidance of new learning disproportionately affects memory for recent events. Remote events, on the other hand, were better learned initially, unhampered by the process of disengagement, and are associated with pleasanter memories of unimpaired youth. For the aged person, his personal significance attaches mainly to events in the past, and these events become increasingly the subject of his conscious awareness. This correlates well with the study which showed good adaptation to old age with reminiscing because it maintained self esteem, reaffirmed a sense of identity, helped work through and master personal losses and contributed to society. Depressed patients in this study, who showed greatest difficulty reminiscing, appeared to have given up hope and to have lost self esteem.

B. Organic Changes

1. Dementia (Diffuse cerebral Disease)

This is an irreversible disorganization of the personality due to degenerative brain changes and is the end-point reached by two different routes. In the senile amnesic type, which is found more commonly in older women and is familial and sex-linked, the gradual destruction of personality occurs in probable correlation with the diffuse loss of neurons in the brain. Since insight is completely lost, the patient may remain happy in a placid and vacant way.

This contrasts sharply with the second type, arteriosclerotic dementia, which affects men at a somewhat younger age and shows a stepwise deterioration. Hypertension is commonly present and the condition runs a shorter course than the amnesic type. History of stroke or epileptiform fit is common. Although the personality is better preserved, the retention of a degree of insight renders the patient more liable to frustration and temperamental outbursts. In such cases there is "emotional incontinence," outbursts of laughter or tears or of both, occurring in the slightest provocation and often incongruous situation.

2. Focal Lesions

Unlike dementia, which is irreversible, many intracranial tumors and space occupying lesions, producing mental symptoms can be corrected. They should therefore be ruled out before any change in behaviour in the elderly is automatically classified as senility (dementia). Localizing physical signs are most rewarding to watch for but several points must be noted. There is a comparative infrequency of headache and papilledema in elderly patients with tumors.³ Epileptiform fits may occur both with focal and diffuse lesions. Major seizures are less common in dementia than are minor attacks, the only indication of which might be some transient disturbance of behaviour. Various physical signs are expected at some stage of the illness in both types of cases, but in dementia their distribution is almost invariably bilateral and symmetrical.

3. Acute Toxic States

The loss of neurons has placed the brain of the aged in a precarious position that can be readily upset by any kind of bodily disturbance, such that a sudden onset of confusion is one of the commonest indications of physical illness in old age. In patients without previous mental impairment, the onset of confusion suggests serious physical illness but in those whose minds are already beginning to fail, confusion may be provoked by quite a minor bodily disturbance. Such reactions are usually short-lived and subside as soon as the physical disorder is corrected. In geriatric practice confusion is most often found as a symptom of toxic organic state, especially of sudden onset. Common conditions are those causing cerebral anoxia such as cardio-respiratory dis-

ease, decreased hemoglobin, dehydration, urinary or fecal retention and drugs as digoxin, barbiturates, and sulphonamides.

C. Psychiatric

If the doctor recognizes the fact that elderly people are also prone to psychiatric illnesses and that not all psychological disturbances or apparent deficiencies are due to "aging" or senile changes in the brain, he can take steps towards treating them as such himself or using consultant psychiatrists in assessing these patients. The two areas that should be kept in mind are affective disorders and schizophrenia.

1. Affective Disorders

Here the main disturbance is emotional, thought and behaviour not being primarily affected, although they are often so. The emotional changes are usually manifested as depression. Useful clues found in depressive states include such symptoms as diminution of energy and enjoyment, loss of interest and ability, poor powers of concentration, impairment of sleep and appetite, and hypochondriasis.

Depression can be classified into 3 groups in the geriatric patient. Firstly, the very environmental and financial conditions of many elderly patients can depress them. Furthermore, he may become isolated and find himself increasingly lonely because he has outlived many of his family and friends and yet is at the age when friendship and social contacts are difficult to establish. The second group includes those patients with a long history of psychoneuroses. They may have had previous breakdowns, a dubious work record, and classically only have trouble getting to sleep but once asleep, they are fine. The third group is the most important to differentiate — the "endogenous depressive". This patient looks ill, often showing considerable loss of weight. His depression has diurnal character, being most pronounced in the morning. Sleep loss is an almost constant feature, waking in the early morning and not obtaining greater than 1-3 hours of sleep. He is usually silent and has little or nothing to say, answering to questions in a delayed fashion in a monotonous tone and as briefly as possible. Unlike the psychoneurotic whose loss of interest is never global but attached to some activities more than others, these patients are often convinced that there is no hope for them and mean what they say in declaring that life is not worth living. The truly depressed patient may start off like the psychoneurotic with morbid preoccupation over tinnitus, constipation, headache or other somatic symptoms but soon tends to shift the blame to himself and finds, what to him, is some discreditable explanation in his past life to account for it. Alternately he may become paranoid and attach blame to the allegedly hostile intentions of other persons, these morbid ideas usually followed by the appearance of organized delusions. Unlike the first two types which can be treated supportively and with mild

use of drugs, this latter type is best treated vigorously with drugs and possibly shock treatment.

2. Schizophrenia

One finds here an abrupt onset of hallucinations. The majority are single widowed women, often suffering a degree of deafness and living in isolation. Their premorbid personality has often been eccentric and antisocial, if not mildly schizophrenic. Prophylactic measures that can be taken include increasing their social contacts, early use of hearing aids and administration of phenothiazines.

II. DEATH AND DYING

Although the elderly are not the only ones who die, and much of what will be said relates to all age groups, no discussion of geriatrics can be complete without consideration of death and dying. More than others, they are aware of death by the loss of people in whom they have important emotional investments and by a growing appreciation that they are nearing the end of their own life. Moreover, they are more likely to have chronic incurable diseases such as heart disease or cancer.

A. *Fears of Death*

When a person is dying, his fears comprise the various meanings that death has acquired for him in the course of his life as well as his responses to the physical and psychological changes that accompany the process of dying. There is no innate knowledge of death, it is learned. The child's first awareness of death as a definite and specific state usually develops between ages of 2 and 4, after speech is reliably established. The most important components of the concept of dying are disappearance of the object, loss of motility and other functions and views that death is the result of violence. The "disappearance of the object" forms a link to the child's fear of abandonment and separation with the feelings of helplessness and loneliness. Since he is surrounded by such examples of death as animals he eats, flies killed in the house and dogs hit by cars, it is easy to see how he connects death with violence. This forms a connection with the child's aggressive impulses on all levels of development so that the fear of dying may express the fear of retaliation for these impulses. From age 3 to 6 years, related to this fear of retaliation for one's aggressive impulses, a child passes through periods in which he experiences anxiety about dying himself. As intellectual development proceeds, the child's magical, animistic view of death and dying are gradually supplanted by a more realistic casually determined concept. However the regression induced by illness and the threat of danger, as well as the degree to which the individual has resolved developmental conflicts as he has matured, are responsible for reawakening these earlier fears related to dying. Most prominent are the fears connected

with separation, abandonment and helplessness and fears of retaliation connected with conflicts around aggression.

There is another model, however, which may not produce as much fear — this relates death with sleep. Beginning in infancy and throughout life, sleep can retain the quality of withdrawing from the demands of reality to peaceful state of oblivion. This notion serves as a prototype for the dying person who sees death as a welcome release from life that has lost much of its meaning, a life in which pain outweighs gratification.

B. *Adjustment To Dying*

Important here are those traits that make it possible for a man to want to live and to find dying painful and still to accept his death as an integral part of his life. Two broad related areas are important.⁵

First there is the degree to which developmental conflicts have been resolved. If the resolution of the child's normal intense early dependence on his mother has resulted in the development of a confident and trustful attitude, he develops increasing self reliance and is better able to tolerate a greater degree of separation from his mother. Later such a person can permit himself to be dependent under appropriate circumstances without becoming anxious and therefore can better tolerate the enforced dependency and passivity of a terminal illness. He can face the separation imposed by dying because it does not so strongly signify a dreaded abandonment. Also, if major infantile conflicts have been resolved, for example, aggressiveness has been directed into channels that are compatible with the individual's standards and ideals, and if close relations are possible without excessive ambivalence, then old irrational fears and reactions, although still present, are less likely to predominate and adaptive, appropriate regression can be permitted. Under these circumstances, the person is freer to come to terms with the reality of dying rather than having to struggle with archaic situations of danger.

Secondly, the man who has committed himself to other people, his work or some cause is sustained by his knowledge that something of meaning will continue after his death. Rather than dissipate their energy in futile efforts to prolong their lives, they may spend it to complete the contribution they wish to leave to the world. When this attitude is possible, those things which are valued most do not die with the individual and therefore some of the desolation is removed from death. By contrast, the man who has not been able to make any commitments but whose efforts and interests have been confined chiefly to himself will find his life becoming increasingly sterile and the end of his own life will mean destruction of every thing of importance to him. For him, death is truly the end, and his sense of futility and the realization that it is now too late to choose another course engenders hopelessness.

C. *The Five Stages of Dying*

Recently, Elizabeth Kubler-Ross⁶ has enumerated the five different stages a dying person goes through. These are not always present in every patient but if they are looked for and appreciated, much will be understood about the dying person's actions and thoughts.

1. Denial and Isolation

The patient's first reaction may be temporary state of shock from which he recuperates gradually. When his initial feeling of numbness begins to disappear and he can collect himself again, man's usual response is "No, it cannot be me". The need for denial exists in every patient at times, at the beginning of a serious illness more so than towards the end of life. Later on the need comes and goes, and the sensitive and perceptive listener will acknowledge this and allow the patient his defenses without making him aware of the contradictions. It is much later, usually, that the patient uses isolation more than denial. He can then talk about his health and his illness, his mortality and immortality as if they were twin brothers permitted to exist side by side, thus facing death and still maintaining hope.

2. Anger

When the first stage of denial cannot be maintained any longer, it is replaced by feelings of anger, rage, envy and resentment — "Why me?" is the question. In contrast to the first stage, anger is very difficult to cope with from the point of view of family and hospital staff since the anger is displaced in all directions and projected onto the environment at times almost at random. Often his complaints and other attempts at seeking attention are really a cry saying "I am alive, don't forget that. You can hear my voice, I am not dead yet." A patient who is respected and understood, who is given some time and attention will soon lower his voice and cease his angry demands.

3. Bargaining

Like a child who demands and then asks for a favor in return for doing some tasks around the house, the terminally ill patient may do the same thinking, "If God has decided to take me from this earth and he did not respond to my angry pleas, he may be more favourable if I ask nicely". In return for a postponement, a patient may promise to "serve a life dedicated to God" or "to give his body to science". Psychologically, promises may be associated with quiet guilt and therefore discussions with the patient may reveal deeper guilt feelings and possibly he can be helped relieved of irrational fears or wishes for punishment because of excessive guilt.

4. Depression

Two types of depression are distinguished, one is reactive, the other preparatory. The first is not difficult

to understand — financial burdens of hospitalization, changes forced upon the family, etc., can be treated with encouragement to look on the brighter side of things and reassurances that the family can still function in their absence. The second type of depression does not occur as a result of a loss but is taking into account impending losses of so many meaningful people and places. The patient shouldn't be encouraged to look at the brighter side of things as this would mean he should not contemplate his death. He should be allowed to express his feelings if he wants to and shown that someone understands — often little or no words are needed and feelings can be mutually expressed by silently sitting together, or a touch of a hand or stroking of the hair.

5. Acceptance

This stage should not be mistaken for a happy sleep — it is almost void of feelings. The patient reaches a point when death comes as a great relief and he dies easier if he is allowed and helped to detach himself slowly from all the meaningful relationships in his life. This is really a time during which the family needs usually more help, understanding and support than the patient himself. Visitors and long conversations are desired less — communications become more nonverbal than verbal as the important thing becomes the visitor's presence as a confirmation that they are going to be around to the end and that he is not forgotten when nothing else can be done for him. Although it is important not to "give up too easily", it is equally important for the patient not to struggle too hard to avoid the inevitable death as the more they try to deny it, the more difficult it will be for them to reach this final stage of acceptance with peace and dignity. Often it is difficult for family and the doctor to differentiate when a patient is giving up too easily and when he is actually in this stage.

D. THE DOCTOR AND THE DYING PATIENT

Before even thinking of what to tell a patient and how to tell it, the doctor should examine his own attitudes towards death — if he views it as a frightening, horrible topic, he can never face it calmly and hopefully with a patient. When he understands himself, then he can assess the patient — how willing he might be to face reality, how heavily he will rely on denial and therefore how much these defenses should be supported or alternately how anxious he might be if this important information is being withheld from him. Blunt confirmation with the prospect of inevitable death can mobilize great terror in anyone and yet false optimism by doctor and family can increase patient's feelings of isolation and cut him off from the support that he could receive from the physician and the people whom he loves. Whether he is told explicitly or not, he will nevertheless come to this awareness and may lose confidence in a doctor who either told him a lie or who did not help him face the

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seriousness of his illness while there might have been time to get his affairs in order. Even the most realistically accepting patients leave open the possibility for some cure or new drug and therefore it is important for the doctor to always leave a ray of hope for them to cling to. Dying is not the enigma many feel it to be and the doctor who can treat all his patients with respect and understanding to meet their individual needs at this time is well on the way to mastering the art of Medicine.

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ERRATA

The last issue of the *Journal* contained several typographical errors. These originated from a mix-up in the final galley proofs from the press.

We regret this mistake and have taken appropriate (and hopefully effective) measures to prevent a recurrence.

T.O.

Hazards Of Bed-Rest In The Elderly

Charles O. Omole, B.Sc., 7T1

*"Teach us to live that we may dread
Unnecessary time in bed.
Get people up and we may save
Our patients from an early grave."*¹

There is a time-honoured general principle of treatment that if a part of the body is diseased, it should be rested. In some cases the whole body is also rested. In recent years there is a growing concern not only over the possible relation of bed-rest to a variety of complications commonly encountered during illness but also as to its optimal use as a therapeutic measure during convalescence.

In the elderly patient, the clinical manifestations of disease often differ in a number of ways from those seen in younger patients; also since geriatric patients are prone to certain complications this article is intended to present and discuss very briefly the common hazards that may accompany bed-rest as a therapeutic measure. These hazards range from the relatively acute pathologic complications as phlebothrombosis, pulmonary embolism and hypostatic pneumonia to the more chronic pathological and functional disturbances which include decubitus ulcers, contractures, osteoporosis, urinary problems, bowel dysfunction, myasthenia, vascular derangement and psychologic changes. Most of the complications enumerated will be discussed with special reference to the geriatric patients. However, the hazards can also be entertained in patients in other age groups immobilized for a long period of time.

THROMBO-EMBOLISM

Phlebothrombosis is well recognized in general and gynaecological surgery, and it is not uncommon in medical wards. It is one of the most disabling and lethal catastrophes that bed-rest can bring to a patient. The etiology of deep vein thrombosis is venous stasis, aggravated by sepsis, trauma or neoplasia. "One theory of phlebothrombosis is that it starts with endothelial damage caused by the weight of the leg on the bed compressing emptied calf veins."¹ Elderly patients are susceptible to paralytic conditions of the limbs, cardiac lesions, like mitral insufficiency or congestive heart failure. These conditions tend to reduce blood flow through the limb vessels and the fact that the elderly patient seems to be less active than the young make them good candidates for thrombo-embolism. Hence it is not surprising that the incidence of deep vein thrombosis in the legs of these patients is alarmingly high. Pulmonary embolism from a deep vein thrombosis is one of the most frequent causes of sudden death in the elderly. Since a significant number of patients show no clinically detectable sign of phlebothrombosis (i.e. unilateral edema with slight cyanosis, calf tenderness or the Homan's sign) every possible prophylactic step must be taken. Mobilization should be the rule at the earliest opportunity. If there is any contra-indication, active

and passive leg movement must be encouraged in bed. Patients should perform breathing exercises and take lots of fluid, they should be free to move in bed and pillows should never be placed under the knees. Anti-coagulants are of value in the prevention of pulmonary emboli in susceptible patients. It is also useful when pulmonary embolism has taken place to prevent recurrences. However, this therapeutic measure carries a great risk in the elderly. Some of them have bleeding tendencies, advanced renal or hepatic disease and moreover, some cannot be relied upon to take their medication regularly outside the hospital. When there is no contraindications, heparin may be used to initiate therapy in I.V. dose of 10,000 units every 4 - 6 hours, starting at the same time a coumadin derivative. Heparin can then be omitted after 36-48 hours, and treatment with coumadin derivative continued for 3 or 4 weeks. Whereas many old people can take full doses of anti-coagulant drugs, there are a number whose tolerance is small, and it is not justified to use these drugs except with strict laboratory control, especially in the early stages. The prothrombin time is usually kept between 2 - 3 times the control value. Elastic bandaging and periods of elevation of the limbs may be needed. Towards the end of the anti-coagulant treatment the patient may be allowed to walk short distances.

In addition to the problem of thrombo-embolism, the altered response of the circulation to the upright position as manifested by dizziness, unsteadiness and the tendency to faint has been experienced by many patients within one week of the assumption of the recumbent position. Experiments indicated that the legs were the principal site of changes responsible for this cardiovascular deterioration and it has been suggested that increased venous engorgement, increased extravascular fluid, capillary fragility and impaired venous or muscle tone play a role.⁴ Normal cardiovascular response to upright position often returns only five weeks or later after activity is reinstituted. Some of this general deterioration can be prevented by resting only the part of the body which requires it. Other parts of the body should be maintained in active condition as explained above. This cardiovascular response to bed-rest, in general, stresses the importance to life itself, of maintaining physical activity, especially of the lower extremities.

RESPIRATORY PROBLEMS

This is an obvious complication in bed-fast patients. The maintenance of one position, and lack of exercise and diminished respiratory excursion during bed-rest have detrimental effects on the physiology and mechanical action of the lungs. There is a tendency towards development of diminished ventilations, which is reflected by decreased tidal volume, minute volume and less frequent deep respiration. As a consequence, collapsed or diseased lungs are not re-aerated. If re-expansion of atelectatic lungs does not take place, progressive conges-

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tion ensues in the dependent parts of the affected lungs. This makes the patient susceptible to respiratory infection and pneumonia. The recumbent position also affects bronchial hygiene. The action of the bronchial cilia which occurs by frequent positional changes in ambulatory or non-immobilized patients is lacking in bed-rest patients. This, together with less effective cough reflex allows the collection of bronchial secretions with resultant bronchial obstruction and atelectasis of larger segments of the lung.

This hazard is quite preventable. Early mobilization of geriatric patients where there is no contra-indication or chest-physiotherapy and breathing exercises when patients have to stay in bed for a few days are of great importance.

The foregoing early hazards of bed-rest are more common in patients with acute problems. Since the incidence of chronic clinical problems in the elderly is high, the effects of bed-rest in these chronic problems need some considerations. Cerebro-vascular accidents and orthopedic and some other clinical problems may lead to prolong bed confinement.

In such patients contractures can become an added permanent disability to the original problem. A true contracture creates a loss of range of motion in a joint due to contraction of some muscles and fibrosis of surrounding tissues. Contractures occur when the limbs are kept immobile for a long period in any position. Patients at risk are those with paralysed limbs, extra pyramidal rigidity, fracture or amputation of the knee, or some may develop from nothing more than lying or sitting immobile. Deformities of postures which develop in patients with chronic diseases are often exact replicas of the improper position which the patient maintained while in bed. Flexion contractures of the hips and knees or plantar flexion contracture of the ankle may prevent ambulation forever. Contractures of the shoulder may immobilize the arms below neck level and interfere with some activities of daily living. Contractures of the fingers may make it impossible for a hand to function even upon subsequent return of muscle strength.

Because of these gross deformities, contractures may be prevented, for once they occur, they are difficult to correct. However reluctant they may be, patients must be encouraged to take walking exercises if feasible or to actively exercise their limbs. Contractures which are likely to follow from neurological disease may be prevented by using passive movements through the full range of each joint at every possible opportunity. Paralysed limbs should be placed in the optimum position of function; this can be maintained by light padded splinting at all times except when active treatment is in progress and later by the use of calipers and similar devices.

The correction of established contractures as mentioned earlier is often difficult and attempts at correction may be protracted and cause the patient much dis-

tress. A brief review of some of the methods used will help reinforce the view that these deformities should be prevented. Simple traction on the affected joint is often ineffective, because the antagonistic muscle group remains in the tonic contraction and perpetuates the contracture which we hope to overcome. Orthopedic measures in the form of tenotomies or lengthening of tendons may be helpful. Cases for this type of procedure have to be selected, for, some types of established contractures can be relieved without operative measures. Because of all these problems, it falls to the duty of the physician, surgeon and the patient's own doctor at home to see that contractures are prevented.

DECUBITUS ULCER

This problem extends back to antiquity and "recent studies have revealed their presence on the mummified body of an old Egyptian priest."² It is an important management problem in bed-fast patients for any reason. Their frequency and dangers are preventable misfortunes which hang over aged invalids and the paralyzed.

Decubitus ulcers are localized areas of tissue necrosis between underlying bony prominence and overlying bed, chair, cast, braces or any other external compression. Seventy-five per cent of all decubitus ulcers occur over the sacrum, greater trochanter, ischial tuberosities, the remainder are found over prominences such as knees, tibial crests, malleoli, anterior superior iliac spines, spinous processes and elbows.³

The basic underlying cause of all decubitus ulcers is pressure. All other proposed causes are the result of pressure, local or systemic conditions which cause or add to the pressure, and predisposing factors. The physical factors which produce or intensify localized compression are friction, edema, moisture, shearing force and spasticity. Conditions which predispose patients to decubiti are malnutrition associated with anemia, hypoproteinemia and vitamin deficiency; motor paralysis with associated muscle atrophy and consequent reduction of mechanical padding between overlying skin and underlying bone; superficial sensory loss with absence of subjective awareness of pain or pressure; and disturbed autonomic vasomotor function as seen in quadriplegics; a fall in blood pressure, venous thrombosis or impaired peripheral circulation.

The elderly who is ill can be regarded as vulnerable as the paraplegic: for if he is unconscious he will receive no stimuli; if he is very frail, ill or apathetic he will respond to none; if he is paralyzed he may be physically unable to shift his position even though his discomfort may be great. Prevention continues to be the best "cure" for decubitus ulcers and this can be achieved by strict adherence to the principles of good nursing care. A vulnerable patient requires turning not less than twice hourly or even more often. Proper positioning with pillows or pads, avoiding elevation of the head of the bed more than 30° and local skin care to keep the skin

clean and dry. All in all, the avoidance of pressure is paramount and the utilization of alternating pressure mattresses, sheep skin, Stryker and Foster turning frames, the circo-electric bed and hydraulic lifts are necessary in some cases.

The prophylaxis of decubitus ulcers include early institution of a comprehensive rehabilitation program where possible and proper nutrition with the maintenance of a positive nitrogen balance and hemoglobin of 12 mg per cent or more. These can be achieved by early ambulation and the restoration of independent activity. High protein diet, vitamins, protein supplements, iron preparations, transfusion of whole blood as required, anabolic agents both natural or synthetic can be of value.

Established ulcers require daily mechanical cleansing and adjunctive measures employing a variety of physical modalities. Local treatment of ulcers is of less importance than the relief of pressure. Necrotic material can be allowed to separate by the application of hot compresses, hypertonic saline or 20% sodium phosphate solutions. Swabs from ulcers should be taken for bacteriological culture and appropriate antibiotic can be used systemically or locally. It may be necessary to carry out debridement for the removal of necrotic and infected tissue; this can usually be done with scissors and forceps without the use of anesthetic agents. When a pressure sore is complicated by infection involving soft tissue or by osteomyelitis, a more extensive surgical procedure will be necessary, since it is only when these tissues including bone have been excised will the natural recuperative process have a chance to heal the sore. Also large indolent ulcers which fail to heal with conservative measures may require surgical excision and full thickness skin-graft closure.

While it has been shown that the majority of elderly patients are not susceptible to the development of decubitus ulcers³, the crucial problem is the prevention of pressure sores in approximately 20% of patients who are especially at risk. These susceptible patients must be identified and vigorous measures should be instituted to avoid the damaging effects of sustained pressures. There is evidence that the incidence of decubitus ulcers is increasing and considerable efforts will be required to prevent them from becoming a disease of the future.

URINARY BLADDER DYSFUNCTION

Patients placed on bed-rest for whatever reason for a long time often develop some disturbance of the urinary tract function. In the first instance, gravity insures a normal drainage of the bladder in the upright position, hence stasis of urine frequently occurs with recumbency. This can set up a vicious cycle of urinary problems. The significant increases in urinary calcium excretion which are far greater than the increase observed in fecal calcium⁴ are of interest in relation to the problem

of urinary tract stone formation. Stone formation of the calcium phosphate variety often presents a major complication during immobilization. There is a definite and sustained rise of urinary pH throughout immobilization. This is unfavourable for calcium phosphate solubility. In the normal individual, a shift in urine toward the alkaline side and an increase in urinary calcium excretion is regularly accompanied by an increase in urinary citric acid⁵. This metabolite, by virtue of its capacity to form a poorly ionized, very soluble calcium-citrate complex, exercises a favorable effect on calcium solubility. The absence of any increase in urinary citric acid during immobilization in the face of higher pH and a greater content of calcium and phosphorus deprives the organism of this protective device and favours calcium phosphate precipitation. This derangement is of little clinical significance for short periods of bed-rest; although urinary calcium excretion begin to increase promptly after the institution of immobilization, high levels are not reached prior to the third or fourth weeks.

The presence of a stone or of epithelial damage secondary to the stone often leads to rapid formation of more stones. These may result in ureteric colic, obstruction with the development of hydronephrosis and finally, damage to the renal parenchyma. There is further a possibility of chronic cystitis. In the elderly, during immobilization the irritability of the bladder may be decreased to such an extent that the voiding reflex may not take place or emptying may be incomplete. This often leads to acute retention with overflow or to simple incontinence. Bed-sores may develop and keep the patient in bed, so initiating a vicious circle of bedridden incontinence. Prolonged incontinence leads to a deterioration of hygienic morale, and a patient may continue to be incontinent from sanitary sloth rather than urological disease. Nursing patient out of bed and early treatment of incontinence may change the clinical outlook of the patient entirely.

BOWEL DYSFUNCTION

Constipation is a real problem for many elderly and inactive patients. Confinement to bed often aggravates this tendency. The causes of constipation are 1) the absence of muscular movement, 2) the change of environment (no one can say why this causes constipation, but it does) and 3) the difficulties of evacuating the bowel in a hospital bed-pan. On a bed-pan, the patient is unable to use his abdominal muscles and his nearness to fellow-patients and poising above his own excrement discomforts and distresses him. Constipation may be heralded by diarrhea and may lead to fecal impaction. However, in an elderly patient with fecal impaction, other causes must be sought apart from bed-rest. To avoid all these problems, reassurance and insistence on physical activity in the upright position and regular bowel habits are of great importance because when enemata fail to relieve the impaction, digital removal has to be practised, a procedure which is as un-

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pleasant to the evacuator as for the evacuee. Also sensible use of mild cathartics, stool softeners, suppositories, fruit juices and increased fluid intake will assist chronically disabled geriatric patients to maintain a normal schedule for their bowel movements.

PSYCHOLOGICAL CHANGES

Briefly, I will consider the effect of prolong bed-rest on geriatric patients. Many of them when subjected to a regime of prolonged bed-rest undergo progressive intellectual and emotional as well as physical deterioration. In the early stages, they exhibit fussiness, pettiness and certain amount of irritability. They then acquire an exaggerated idea of seriousness of their illness to the extent that in later stages of their confinement to bed, they lose the desire to get up and even resent any efforts to extract them from bed. Thus, the impact of the disability they may have is aggravated by bed-rest, which renders them dependent on others. Frequently, patients conclude that their usefulness is over and that they will become burdens to their families. Also a great deal of insomnia and nocturnal restlessness and wanderings may be related to the abuse of rest. Too much sleep during the day means too little at night.

To some extent, the mental deterioration, and tendency towards dependency of bed-rest patients may be prevented through physical activity provided by occupational and physical therapy programs and by social activities associated with visitors, the intellectual stimulation of reading, television and radio and the optimistic encouragement by the physician that restriction to bed is very essential and is only temporary.

In conclusion, it should be emphasized that in a changing world we must adapt to changing circum-

stances. The criteria for justifiable bed-rest must be critically evaluated at frequent intervals as medical knowledge changes. For example, in the past bed-rest was an important adjunctive therapeutic measure in the treatment of myocardial infarction, but presently, such patients are treated as bed and chair patients and allowed to use the commode and following a period of physical conditioning, some may return to highly stressful occupations. Bed-rest may have beneficial effects in some acute clinical problems, but its overdose is accompanied by some irreversible side-effects, some of which have been discussed in this article.

"Early ambulation and be saved" is the motto which should be put in each patient's room. And before a doctor advises bed-rest, he should ask himself whether this prescription is necessary and if so, how little will suffice. Without doubt, early restoration of normal general activity is an aim in itself, and by and large, an important aid to convalescence.

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Suicide And The Elderly

James Fitzgibbons, B.Sc., 7T2

Suicide is one of the major causes of death within the general population. It is among the top ten causes of death, resulting in about one per cent of the deaths reported each year. However, more accurate and realistic records might well show that its incidence is even higher, as many suicides are reported as accidents or natural deaths.

The United States Bureau of Census has estimated that in 1970, twenty million persons (about ten per cent) in the U.S. will be sixty-five or over; and that due to medical advances, there will be twenty-five million by the year 1985.¹ Suicide rates are much higher for this group, increasing with age in both sexes. White males over sixty-five commit suicide three times more often than do white men in their twenties and four times more often than the overall United States rate. White females over sixty-five commit suicide twice as often as white females in their twenties, although this represents a drop from the high rate of suicide for women between the ages of forty-five and fifty-four. The data for blacks is not complete, but the rate for blacks over sixty-five is two to three times less than for whites in the same age bracket.

There are many factors involved in the sharp increase in the incidence of suicide in the elderly. Many people are not prepared to graciously surrender the things of youth and fail to compensate for the physical, social, psychological, and economic losses that may occur in old age. Our society has done poorly in its efforts to facilitate the adjustment to old age. The attitude that little attention need be paid to old people since "they will die soon anyway" is widespread, among doctors as well as among others.

Old people, once they have decided upon suicide, tend to choose more lethal methods of self-destruction, and, therefore, have a higher rate of successful suicide. It is a myth that "those who talk about it don't do it," and announcements of possible attempts to commit suicide should always be taken seriously. The hints given by older people that they are contemplating suicide — the "cry for help" — are often more subtle than with younger people and should be looked for more carefully.

Suicide rates are influenced by a wide variety of conditions that occur much more commonly in old age than in youth and increase the risk of suicide. Some of these are as follows:

1) Disabling and/or painful physical illness

Dorpat³ reported that, in a sample of completed suicides in patients over the age of sixty, over half had an active serious physical illness at the time of death. Patients may prefer to bring about death quickly rather than to wait for it to happen. They may feel they are a burden to friends and relatives or that the pain and financial setbacks resulting from long illness are not

worth enduring. Loss of health, strength, usefulness and changes in appearance, hearing, vision, sexual potency, etc. may be enough to push a barely compensated individual to suicide.

2) Depression

Depressions occur so commonly in old age that there is a danger that physicians will consider them unavoidable and not worth medical attention. Field studies⁵ have indicated that twenty-five to thirty per cent of old people suffer from emotional disorders of a mild to severe nature, and that many of these are depressions. Many of the worst depressions occur in previously very healthy people who have recently suffered an illness, sometimes only a trivial illness. The highest suicide potential exists in psychotic depressions. Patients making unsuccessful suicide attempts are relatively more likely to have neurotic or sociopathic personality disorders than psychotic depression.⁶

Moderately to severely depressed patients often suffer loss of weight, anorexia, loss of sex drive, constipation, hypochondriasis, inability to sleep well, early morning awakening, despair, preoccupations with self, feelings of inferiority and worthlessness, feelings of hopelessness, and hostility (which has usually been directed inward). The patient often feels run down, may remain nearly motionless for long periods (or may alternatively become agitated, restless, and explosively violent), and has little or no sense of humor. There may be weeping, and questions are usually answered simply and without accentuation. Delusions, especially paranoid, are common in psychotic depressions. There is often a history of compulsive behaviour in patients suffering from psychotic depression. These people typically are hard working, perfectionistic, and unwilling to adjust to new situations. Anger, resentment, and hostility are introjected, leading to depression and, often, severe feelings of guilt about the hostile feelings.⁸

3) Previous suicidal attempts

Gardner⁹ reported that suicide occurs nine times more frequently in people with histories of suicide attempts than in those without such histories under age fifty-five, and eighteen times more commonly among those with histories of prior attempts in those over fifty-five. Even if the patient (most commonly a female) has carried out a series of abortive attempts, the physician should not assume that no danger of death exists, as this reaction may provoke a more "serious" attempt.

4) Bereavement and loss

The likelihood of mortality to one's friends and relatives increases as one gets older, and recent or recurrent loss of loved ones increases risk of suicide, especially if new relationships are not substituted. Economic loss, in the form of employment, income, or property, and loss of social status often reduce the person's desire to live. Most common losses leading to suicide are of mates,

employment, income, physical health, mental health, longevity of life, and social status.²

5) *Organic brain disorders and paranoid schizophrenia*

In several series³ organic dementia is present in ten to twenty per cent of suicides in old age. The symptoms of dementia are often so similar to depression that it may be impossible to discriminate between the two on clinical grounds alone, especially when the dementia seems to be of rapid onset. In a series of 134 completed suicides by Robins *et al.*,¹⁰ five were diagnosed as chronic brain syndromes, three schizophrenia, and twenty-five undiagnosed but definitely mentally ill. This group was not selected on the basis of old age. Presumably the fraction of organic dementia would increase with age, approaching the ten to twenty per cent proportion.

6) *Chronic alcoholism*

Suicide potential increases remarkably with chronic alcoholism. In the study by Robins above, thirty-one of the 134 suicides suffered from chronic alcoholism. The relationship between alcoholism and suicide is not clearly agreed upon. Menninger considered alcoholism a form of self-destruction or a slowly progressing suicide. Others¹² do not find any increased self-destructive urge in heavy drinkers over that found in non-alcoholics. The reasons for alcoholism are clearly complex, involving various somatic, sociocultural, psychological, and possibly hereditary factors. However, whatever the etiology for chronic alcoholism, alcoholics often feel intense guilt and remorse after "binges." The release from normal inhibition afforded by alcohol may make it easier for them to end their misery by suicide.

7) *Loneliness*

Suicide rates are always lower when there is a sense of cohesion — of belonging to a group. People living alone are much more likely to commit suicide than married people, and the likelihood of death of companions or mates rises with advancing age. Deeply religious communities have lower suicide rates than non-religious communities, probably due to a large extent to the sense of belonging to a group and by virtue of being subject to group inhibitions towards suicide. More socially isolated people do not feel these same inhibitions. Older people often need guidelines drawn up for them to feel secure and feel acute anxiety and disorganization when these rigid patterns are not available to them.¹ As traditional patterns of life style, order, and morality are more and more de-emphasized in our society, suicide rates may well be expected to rise among the older people in our society, who are becoming increasingly confused, insecure, and apprehensive in the changing world.

An intelligent approach to the treatment of a potentially suicidal patient must include a careful investigation of the factors making this individual a high risk case. In many types of impending suicide, treatment is

highly effective if the psychodynamics are well understood.

The "predispositions to suicide" listed above do not in themselves explain why any particular person takes his own life. Most commonly, the personal calamities befalling the pre-suicidal patient generate depression, with feelings of uselessness, hopelessness, and despair. But emotions of anger leading to resentment may be generated, and suicide may be a means of expressing aggression — of getting back at others. Guilt, especially with chronic alcoholics, may be the predominant emotion in the immediate pre-death period. Sadness, as with the death of a beloved husband or wife, may make life alone unbearable.

Concepts of the meaning of death are highly relevant in the psychodynamics of suicidally inclined people. Menninger felt that in suicide, the person killed was one who was once loved, then internalized, then hated. This person can be considered to be the suiciding person himself, in which case a desire to be killed is most important. It can also be by another person, in which case the desire to kill is uppermost. But these outward hostile feelings may be intolerable to the person and become introjected, leading to depression. The person feels intensely guilty for these hostile feelings, and the ultimate punishment for them is death.

It is interesting that, once a depressed person decides to kill himself, he may feel such a release of tension that he appears cheerful and smiling, having resolved the conflict. A "smiling depression," then, which appears suddenly in place of a gloomy depression, is not necessarily a hopeful prognostic sign.

Jung suggested that by dying, a rebirth into a more worthwhile and fulfilling spiritual existence might be anticipated. Many older patients express a wish for such an existence.

Karen Horney stressed the notion of acute awareness of real or imagined abandonment by others and a desire to retaliate by suicide as influencing suicidal patients.

Clearly, patients are commonly not conscious of their own rationale for ending their lives, and patients who announce an intention to kill themselves may be able to offer only simplistic reasons for this decision. A person living alone, with a serious physical illness, in financial difficulty, who has lost his companions and social status, is obviously a high risk for suicide; but he may not be aware of the importance of some or all of these in a depression. It is important for the physician to identify the important elements and try to generate meaningfulness in a life that seems empty.

If the danger of suicide is acute, the physician must intervene on a very personal basis with the patient, regardless of the underlying psychic mechanism. Physical treatment can be quite effective, especially in depres-

sion. Electro-convulsive therapy remains the treatment of choice in psychotic depressive reactions. Efforts must also be made to lessen hostile feelings, redirecting them into other outlets. Self-control must be re-established, especially since psychotic depressives are commonly compulsive. To these people control is very important.

In the case of psychoneurotic depression, feelings of failure or loss must be reduced and new goals or meaningfulness substituted. Anxiety-producing problems — such as worry over health, money, or status — must be diminished.

Both groups of depressives may respond to anti-depressant drugs, such as tranylcypromine (Parnate), imipramine (Tofranil), and amitriptyline (Elavil).

The prognosis for geriatric depressions is good if the mechanisms involved in their pathogenesis are understood and properly dealt with.

In all suicidal patients, the physician must establish trust. The patient needs to have confidence, not just in his doctor's professional competence, but also in his sincerity and warmth. The patient should feel that the doctor is doing what is best. Other people, especially friends and relatives, should be encouraged to comfort and reassure the patient. Activities or some form of meaningful employment are desirable for older people.

The psychotherapeutic task with suicidal geriatric patients is probably more difficult than in any other age group. The physician may be at a loss to offer consolation to the question "What have I got to live for?" from a seriously ill, lonely, elderly person.

Various "protective" factors exist which aid in the adjustment to old age. These include available sources of pleasure, education, friendships, good family relationships, social prestige, meaningful employment, good health, economic security, adequate provision for dependents, and favorable adaptation to past stress. It may comfort the individual to have these commended upon,

praised, and encouraged. He should be led to feel proud of his accomplishments without the implication that his usefulness is over.

General medical practice and most specialty practices include a high proportion of geriatric patients. With all patients, but perhaps especially with older patients, a physician will not be very successful in his treatment if he is unwilling to look for psychological as well as physical disorder. Doctors should be aware of signs of the possible development of situations that often lead to suicide. Clearly, physicians are admirably placed to lend considerable support to patients at a time when a little warmth and understanding may make life seem worth living.

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The Problem Fracture in The Elderly

Titus Owolabi, TT1

When a compromised physiologic reserve is combined with peculiarities of blood supply, the stage is set for problems in fracture healing. This is the situation encountered most frequently in a fractured hip. The fracture occurs most frequently in the elderly woman; its management is problematic, its complications are distressing. Although it has been variously described as "the unsolved fracture", "the unsolvable fracture", "the dreaded fracture of old age", it seems more appropriate to describe it as the problem fracture in the elderly.

DEFINITION AND CLASSIFICATION

In this article, a fracture of the hip is taken to be a destruction or loss in continuity of bone tissue at any site from the head of the femur to a point about one centimeter distal to the lesser trochanter of the femur. Although pathological fractures may occur, the vast majority of hip fractures are caused by trauma, often very slight. Several classifications of hip fractures have been proposed. All are based on the anatomical location of the fracture line. The classification used here is based on the position of the fracture line relative to the hip joint capsule which extends from the rim of the acetabulum, enclosing the head and neck of the femur, and terminating on the latter.

Hip fractures are thus classified as:—

I. INTRACAPSULAR

- a) Subcapital
- b) Transcervical
- c) Basal cervical

II. EXTRACAPSULAR

- a) Trochanteric (Intertrochanteric)
- b) Subtrochanteric

This classification is particularly useful because it groups all intracapsular fractures together. These are particularly notorious for two complications *viz* avascular necrosis of the head of the femur and non-union.

INCIDENCE

Fracture of the hip occurs mainly in individuals over the age of 60. In most published series, over 90 per cent occur in the elderly. The incidence depends on the clientele of the particular medical centre. Thus, hospitals with very active orthopaedic or geriatric services tend to see more cases than other general hospitals of comparative size. In a series of 307 patients reported from Sweden¹, the mean age was 71.5 years. A recent American report shows the incidence of hip fracture in white females between the ages of 65 and 74, to be 5 per 1,000 per year, and 19 per 1,000 per year for those over the age of 75 years. At the Toronto Western Hospital where there is a defined geriatric service, in a series of 100 patients, men and women, with fractures of the upper end of the femur, the average age was 80

years.³ Friedenberg and Baird recently reviewed a series of 200 consecutive fractures of the hip seen at the Presbyterian-University of Pennsylvania Medical Centre. They reported an average age of their patients to be 77.5 years. Eighty-five per cent of such fractures occurred in the female. They also pointed out the interesting fact that hip fractures are infrequently encountered in the black race. Only 4 per cent of their series were black although 40 per cent of their hospital admissions during this period were black.

MECHANISM

The main predisposing factor for the fractured hip is generalized osteoporosis in old age. Atrophic changes in bone interstitial tissue leads to a decrease in bone mass per unit volume. This leads to decreased tensile strength in the bony skeleton. A minor fall or stumble then produces a rotational force which is sufficient to crack the fragile neck of the femur. From this point, the exact detail probably varies from one patient to another, but the main features are constant in all varieties of injury.

When a fracture is produced, the neck twists forward away from the head of the femur. The line of the fracture spirals across the diameter of the neck. Frequently, a postero-inferior cortical tongue is left projecting from the neck. An equivalent antero-superior tongue of cortex remains attached to the femoral head. These cortical tongues are often seen on X-ray. A particularly forceful injury may produce a comminuted fracture. Because of the fracture, the femoral lever is disrupted at the neck. The line of force of the iliopsoas and the gluteal muscles then becomes redirected. The iliopsoas which in many positions of the hip acts as an internal rotator, can now only act as an external rotator. The powerful gluteal abductors can now only draw the shaft proximally. The net result is that the unreduced limb lies short, and is externally rotated.

Where there is a complete transcervical fracture, the femoral head will probably remain in a normal relationship to the acetabulum. The distal fragment will shorten. This external rotation deformity causes the neck to assume a position of exaggerated anteversion. This is best seen on a lateral projection on X-ray.⁵

CLINICAL FEATURES

Usually the patient presents as an elderly woman who tripped or was knocked down. After falling the patient could not pick herself up unaided and is unable to put weight on the limb. If on the bed, the patient lies still on her back and does not voluntarily move the leg on the affected side. A quick inspection reveals the gross clinical status. The most striking feature is that the limb of the fractured hip is shorter than the unaffected limb and is laterally rotated, sometimes very markedly.

Any attempted active or passive movement of the broken limb causes excruciating pain.

In very rare cases, the patient fell and got up herself; there is no demonstrable shortening or lateral rotation, and the limb can be gently moved without inducing pain.

In extracapsular fractures, the pain is obviously maximal over the trochanteric region and a delayed visible ecchymosis is sometimes seen at the back of the upper thigh one to two days after the accident. This visible ecchymosis does not occur with intracapsular fractures where bleeding is within the joint capsule.

The diagnosis of a fractured hip should not be too difficult to make from the history and physical examination. A reasonable deduction can also be made as to whether the fracture was intra-capsular or extracapsular. This is then confirmed by X-ray studies of the hip in antero-posterior and lateral projections. Intracapsular and extracapsular fractures are seen with approximately equal frequencies. In a recent review of 200 consecutive fractures of the hip, the statistics break down as follows⁴:

Intracapsular (49.5%)		
(1) Subcapital	20	percent
(2) Transcervical	19.5	
(3) Basal Cervical	10	
Extracapsular (50.5%)		
(1) Trochanteric	44.5	
(2) Subtrochanteric	6	

PREOPERATIVE ASSESSMENT

It is now widely accepted that unless there are definite contraindications for operating, surgical intervention is the treatment of choice for a patient with a fractured hip. The contraindications for surgery are:

- terminal disease;
- history of myocardiac infarction;
- active pneumonia or respiratory tract infection;
- chronic debilitating disease which precludes walking, provided the patient can be mobilized without much pain.

Preoperative assessment therefore includes a complete physical examination which is followed by chest x-ray, ECG, haemogram, urinalysis, serum electrolytes, random blood sugar and BUN. A fractured hip is not regarded as an emergency and the three to four days necessary for the preoperative assessment are duly utilized. Any abnormalities discovered are considered in the pre- and post-operative management of the patient. If there is no contraindication to surgery as outlined above, the patient is operated upon three to five days after admission.

While waiting for surgery, the patient is made comfortable by applying traction to the leg. Some centers

put the patient on intermittent positive pressure machine. Special attention is paid to adequate bladder and bowel function and the prevention of pressure sores. These develop quickly in the elderly patient who frequently spends much of his or her time in bed under normal circumstances.

OPERATIVE TREATMENT

The ideal result of the operative treatment is to reduce the fracture anatomically and to immobilize the *fracture* after reduction. This, in theory, will promote healing and allow for radiological and clinical union of the fracture. In the post-operative patient, active movement of the uninvolved joints is imperative if the disadvantages of prolonged bed rest are to be avoided. This is particularly true in the elderly as discussed in another article in this issue. Various surgical techniques have been devised to reduce the broken hip and immobilize it by internal fixation. A discussion of these is beyond the scope of this paper. It should be mentioned, however, that in the younger age group, a fractured hip may be managed by operative reduction and internal fixation by the use of a suitable metal device (nailing). The three-flanged Smith-Peterson nail was formerly widely used to fix the fractured neck of the femur. Other variations include the Tulloch-Brown telescopically sliding nail and plate, also for intracapsular fractures and the Jewett nail-plate and screws for extracapsular fractures.

In the geriatric population where the vast majority of fractures of the hip occur, nailing is ineffective as a treatment for a broken hip. With nailing, the incidence of avascular necrosis of the head of the femur is very high, probably about 70 percent although only about 30 percent present as clinical problems.

Because nailing of intracapsular fractures is associated with a high incidence of aseptic necrosis of the head of the femur, non-union, malunion and degenerative joint disease, most surgeons now advocate immediate replacement arthroplasty. The operation consists of removing the head of the femur and replacing it with a metal prosthetic femoral head. Moore prosthesis is perhaps best known. It consists of a Molybdenum-Aluminium alloy. The spherical head fits into the acetabulum and its stem is introduced into the medullary canal of the femoral shaft. Extracapsular fractures are rarely associated with the complications seen in intracapsular fractures for reasons outlined below. They may be treated by nailing and often heal well after being so treated. The clearcut indication for the use of Moore prosthesis are:

- for the elderly patient;
- for markedly displaced fractures;
- for a "failed nail".

THE PROBLEM FRACTURE IN THE ELDERLY

POST-OPERATIVE CARE

Early post-operative mobility is emphasised in the management of these patients. By this programme of 3 to 4 weeks of active bed rest, the patient is assisted to sit in bed, dangle his legs several times a day, and encouraged to generally perform the maximal physical (and mental) exercises possible. The physiotherapist is actively involved in this programme. In a recently completed study in Toronto, phlebography was used to demonstrate deep venous thrombosis (in the affected limb) in clinically unsuspected cases in patients with fractures of the proximal end of the femur³. Many surgeons now routinely anticoagulate their post-operative cases unless anticoagulation is contraindicated for other medical reasons. This is to reduce the incidence of thromboembolic phenomenon and pulmonary embolism. The patient is kept on the "active rest" regime and generally discharged 3 to 4 weeks post operatively. The follow-up visits are arranged as warranted by the clinical picture.

COMPLICATIONS

In general, any fracture requiring operative reduction is subject to a number of complications. A fractured hip is no exception. These complications can be classified as immediate, intermediate and delayed.

Immediate complications of hip fractures are taken to be those occurring within the first 24 hours of the injury. These include pain, shock which is more likely neurogenic than hypovolemic, and aggravation of any pre-existing disease. Neurogenic shock is rare in these patients and if present is usually transient and self-limiting. The other immediate complications are discussed under pre-operative assessment. Fat embolism, which is not uncommon after fractures of long bones, is in fact rare in hip fractures.

Intermediate complications occur within the first 48 hours following operation. They are mostly the usual complications of any major surgical procedure and include neurovascular injury, anaesthetic problems, post-operative aspiration, bladder and bowel dysfunction.

Delayed complications are the most common and the most severe. Infection (osteomyelitis) and hip deformity due to improperly set fractures are not infrequent. Volkman's ischaemia, myositis ossificans and sympathetic or neurotropic disorders e.g. Sudeck's osteodystrophy, are rare complications of hip fractures. Three late complications do occur very frequently in hip fractures and will be discussed at some detail. They are:

1. Avascular Necrosis
2. Non-union
3. Late degenerative joint disease

They occur frequently partly because advanced age frequently means a diminished anatomic and metabolic reserve and partly because of peculiarities of local blood supply to the head of the femur.

Avascular Necrosis of the Head of the Femur

The head of the femur derives its normal blood supply from three sources:

- 1) Branches of nutrient vessels within the substance of the bone.
- 2) The capsular vessels reflected onto the neck of the femur.
- 3) Vessels from the *ligamentum teres*, the ligament of the head of the femur.

With an intracapsular fracture, only the vessels of the *ligamentum teres* bring blood to the femoral head. Under normal circumstances this is variable and the blood brought by these vessels may be inadequate to sustain the head of the femur. In old age where arteriosclerotic and other degenerative changes may have produced marked stenosis of the arteries in the ligament to the head of the femur, the nutrient supply to the bone may be so small that the cells die. This is termed avascular necrosis. It may be complete or partial. This complication is prone to occur whenever a fracture is likely to result in a precarious change in the local circulatory anatomy. Thus it commonly occurs in the head of the femur, the lunate, scaphoid and talus.

Avascular necrosis results in collapse and fragmentation of the femoral head, months or years after the fracture. Total necrosis leads to complete disorganization of the hip; a partial one leads to non-union, mal-union or degenerative joint disease. The true incidence of avascular necrosis of the head of the femur treated by nailing is unknown but must be quite high. Figures reported in the literature average about 30 percent but range from as low as 4 percent to as high as 56 percent of healed cases.

NON-UNION

This may be caused by a partial avascular necrosis or by incomplete immobilization of the fracture following internal fixation by screws and nails. Improperly positioned metal devices, improper fixation and flushing of fracture haematoma by excessive amounts of synovial fluid are also said to produce non-union.

The patient seemingly tolerates internal fixation well and makes clinical progress. She soon starts to complain of renewed pain at the site of the fracture and may present clinically like a fractured-hip patient. Physical examination and radiography provide definitive diagnosis. This complication is quoted as occurring in about 15 percent of treated cases, the figures ranging from zero to 25 percent of reported series.¹ Replacement arthroplasty, excision arthroplasty (Girdlestone pseudoarthrosis) or arthrodesis of the hip are alternative methods of treatment for avascular necrosis and non-union of the fractured hip.

Degenerative Joint Disease

The mechanism of development of this complication is varied. Direct trauma and damage to the articular

cartilage at the time of the fracture, or during manipulation or operative reduction may all lead to subsequent degenerative changes in the hip. Partial avascular necrosis of the femoral head may lead to collapse at the articular surface. Impairment of the blood supply to the basal layers of the cartilage, which are nourished from vessels in the subjacent bone, may lead to cartilage necrosis. This will result in degenerative joint disease even after bony union of a fracture of the hip.

This complication may be managed medically. Should analgesics and anti-inflammatory medication fail to control symptoms, operative intervention is indicated. This may eventually take the form of prosthetic replacement of the femoral head to produce satisfactory results.

CONCLUSION

The prevention of these three complications has influenced the current management of the fractured hip in the elderly more than any other one single factor. To avoid these problems, replacement arthroplasty is now used in most centres as the preferred — and some say only — method of treatment in the old patient, unless surgery is absolutely contraindicated. Since replacement by a prosthetic femoral head is probably the only satisfactory method of treating any of the frequent complications discussed above, the marked improvement in the results of a broken hip since the inception of Moore's prosthesis is not surprising.

The Austin-Moore prosthesis too is not without its problems. Among some of the late complications of a prosthetic hip are narrowing of the joint space and cystic degeneration of the periacetabular bone. In addition, erosion of the acetabulum by the prosthesis may lead to intrusion of the prosthesis into the pelvis or stress fracture of the metal.⁶

These problems have stimulated research geared to the development of better prostheses. A Norwegian, Tor Christiansen, introduced a new hip prosthesis with trunnion-bearing in 1967, the physics of which should permit movements at the hip joint to be transmitted to the trunnion-bearing. Ramstad from the same centre recently reported on 78 patients who, within the last two years, were fitted with the trunnion-bearing prosthesis with excellent to good results in about 50 cases. However, this is a preliminary report, it is not a double blind study, the series is small and the follow-up duration is still very short.

SUMMARY

A fractured hip is a problem fracture in the elderly. They are particularly predisposed to it because of generalized osteoporosis. Fractures at the hip are classified broadly as intracapsular or extracapsular. Intracapsular fractures are prone to the major complications of avascular necrosis, non-union and late degenerative joint disease. Both types of fractures are usually easy to diag-

nose. The affected limb is shorter and laterally rotated and very painful to move. In the elderly, prosthetic arthroplasty is the treatment of choice. An adequate pre-operative assessment and a post-operative programme of active bed rest for about one month decrease the operative morbidity and mortality. To avoid late complications, markedly displaced fractures should also be treated by replacement arthroplasty.

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Logical Approach to Learning Clinical Diagnosis*

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INTRODUCTION

Many techniques (programmed books, teaching machines, computer-assisted instruction) have been designed recently to improve the teaching of medicine. However, the teaching of diagnosis has not been changed much and it is still conducted in a traditional way through bedside training and clinical clerkship. Although these are the most honored methods of acquiring the art of diagnosis, they may be considerably improved by new techniques. One way of achieving this is to use logical methods for evaluating medical data. This will be illustrated by using electrocardiography as an example.

Electrocardiography is one of the most difficult examinations to be interpreted routinely in medical practice and it takes a considerably long time to become skillful in this field. This is because the amount of data in electrocardiographic tracing is extremely large as compared, for example, with the data in a carotid pulse curve. So the first task in learning electrocardiography is to memorize what is normal and what is abnormal in ECG tracings. With the large amount of data, however, another problem arises, i.e., the problem of the evaluation of data. There may be a hundred or so different methods of data evaluation but only a few are adequate, efficient and prompt.

Logical trees

One of the most efficient methods of evaluating data is the binary logic system, which employs "yes" (or "one") and "no" (or "zero") notation. This system can be conveniently depicted in the form of a logical tree.

The logical tree is a structure composed of nodes representing questions from which "yes" and "no" branches extend to other nodes or to terminals. Nodes and branches are arrayed in successive levels, the highest level being the "zeroth" level, the next to the highest being the "first" level, and so forth (see Fig. 1).

It is important to realize the effectiveness of this method in reducing the number of steps needed to evaluate data. For example, to determine the suit of a playing card by this method, only two questions are to be asked. The first question could be: "Is the suit hearts?". If the answer to the first question was "no" then the next question could be: "Is the suit spades?". On this method is also based the popular game of

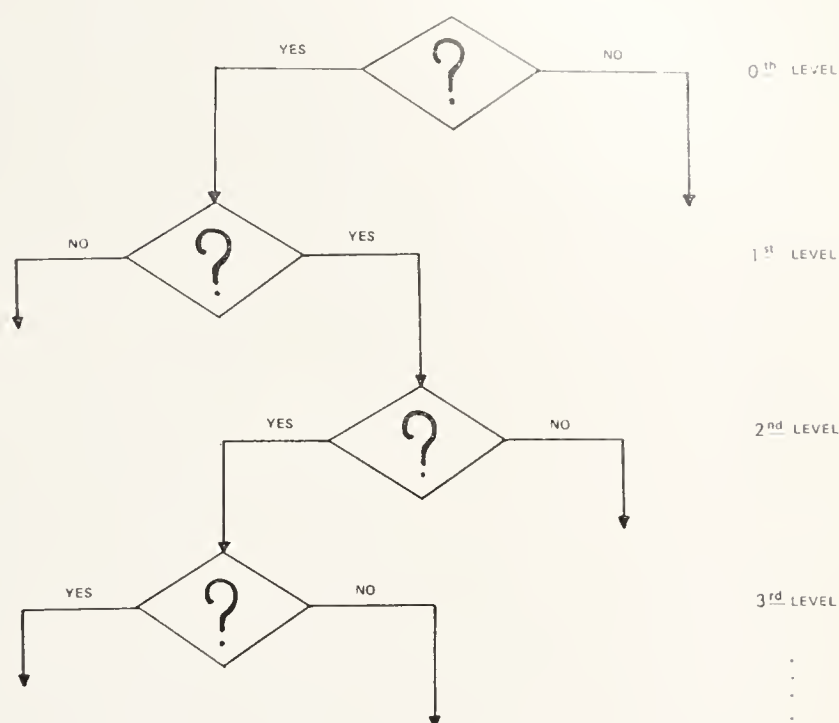


FIGURE 1

"Twenty Questions" when only "yes" and "no" are allowed as answers; twenty such questions cover 1048576 alternatives. If the evaluation of ECG items were arranged to be dichotomous so that only "yes" and "no" answers were necessary then answering only 10 questions would cover 1024 different diagnostic categories (far above the number presently distinguished by medical knowledge).

The general idea of constructing the logical tree in electrocardiography is that the ECG item representing a node in the k^{th} level should separate ECG diagnostic categories at this level as equally as possible. This requirement may be approximately accomplished by placing "strong" ECG items on the higher level and "weak" ECG items on the lower level of the logical tree. By "strong" ECG items are meant those which are more general and can eliminate many ECG diagnostic categories from further evaluation. For the efficient evaluation of electrocardiographic patterns the hierarchy of ECG items could be the following:

- 1) regularity of the PR interval;
- 2) rate of occurrence of QRS complexes;
- 3) QRS duration and configuration;
- 4) presence of the P wave;
- 5) PR interval duration and regularity;
- 6) Q duration and amplitude;
- 7) R amplitude and S amplitude;
- 8) ST segment configuration;
- 9) T wave amplitude;
- 10) P wave amplitude and duration.

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By checking if the PR interval is regular (i.e., if the difference between successive PR intervals greater than 15% occurs in less than one-third of all PR intervals) one may divide all ECG tracings into two large groups: one group will consist of tracings with regular (or dominant) rhythm and the other of tracings with irregular rhythm. For the tracings with regular rhythm (which accounts for the majority of examined electrocardiograms) the next item to be checked is the heart rate. The advantage of employing the heart rate at the early stage of the ECG evaluation is that the number of

possible rhythms is reduced considerably because of considering only those with the heart rate type found. For example, when the heart rate is above 60 per minute one may exclude from further consideration bradycardia, nodal rhythm or idioventricular rhythm. On the other hand, when the heart rate is below 100 per minute all types of tachycardias may be eliminated. In this way, by asking just two questions, one can divide all ECG tracings into four relatively small groups and perform further differentiation within one of these groups only, thus saving a good deal of time.

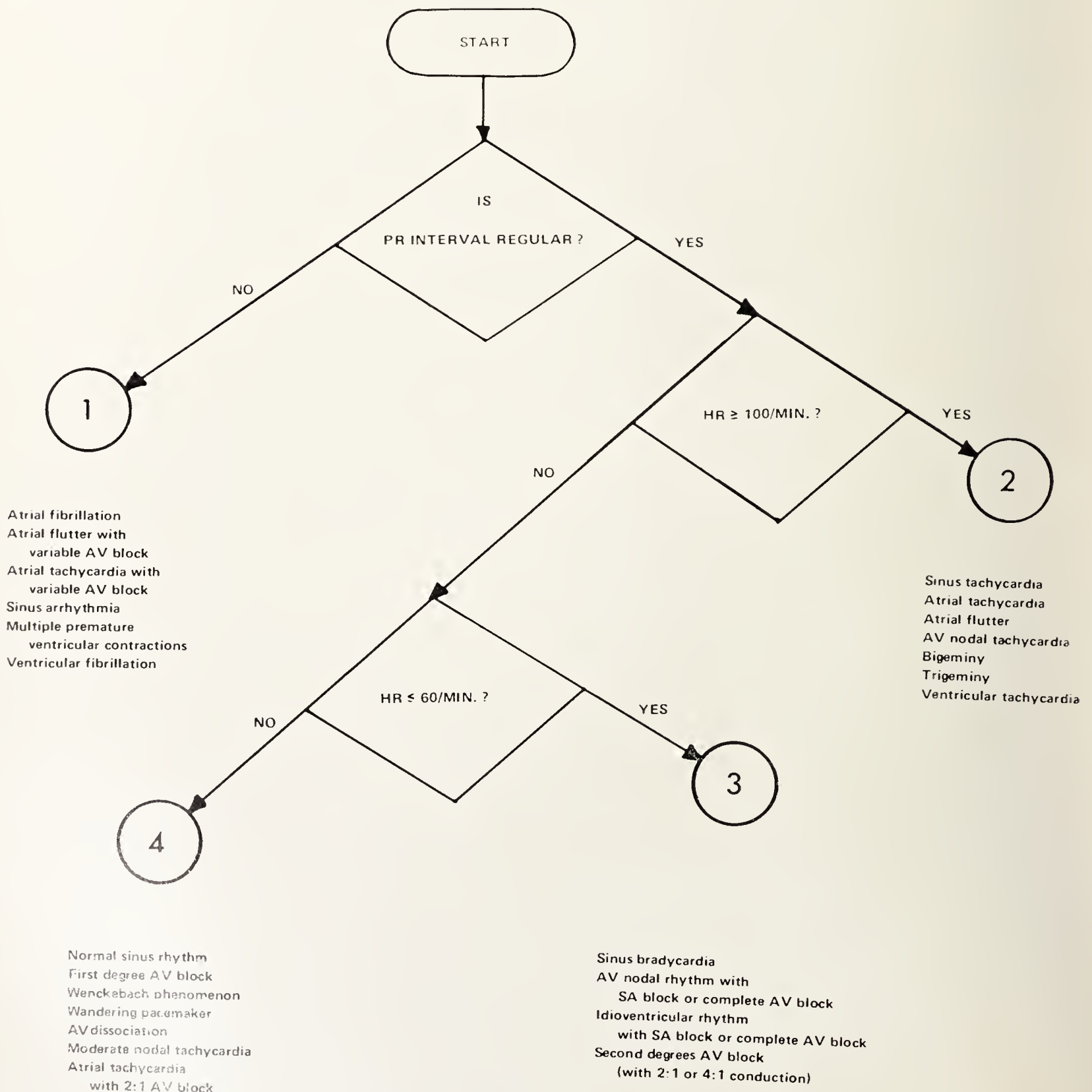


FIGURE 2a

LOGICAL APPROACH TO LEARNING CLINICAL DIAGNOSIS

FIGURE 2b

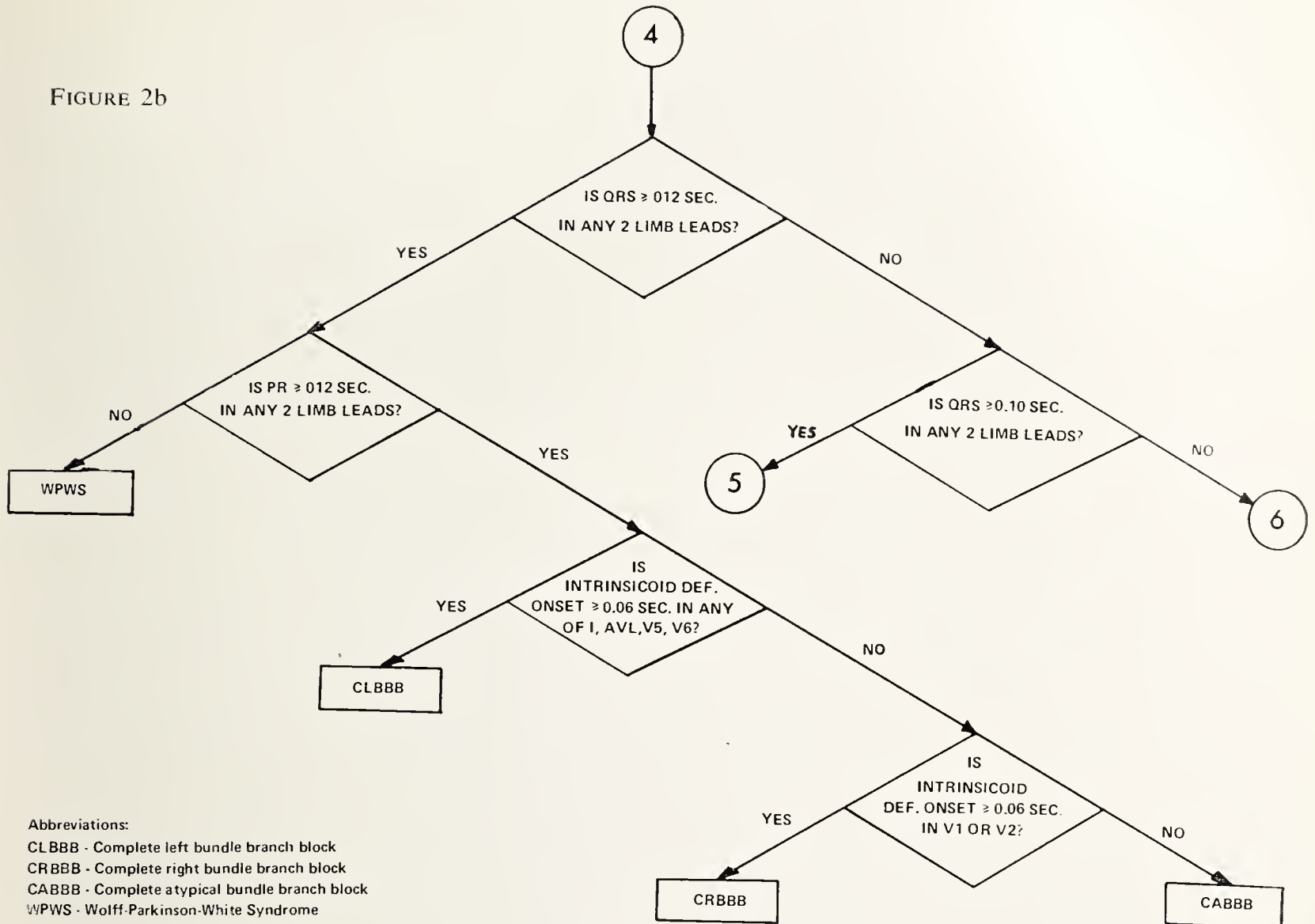


FIGURE 2c

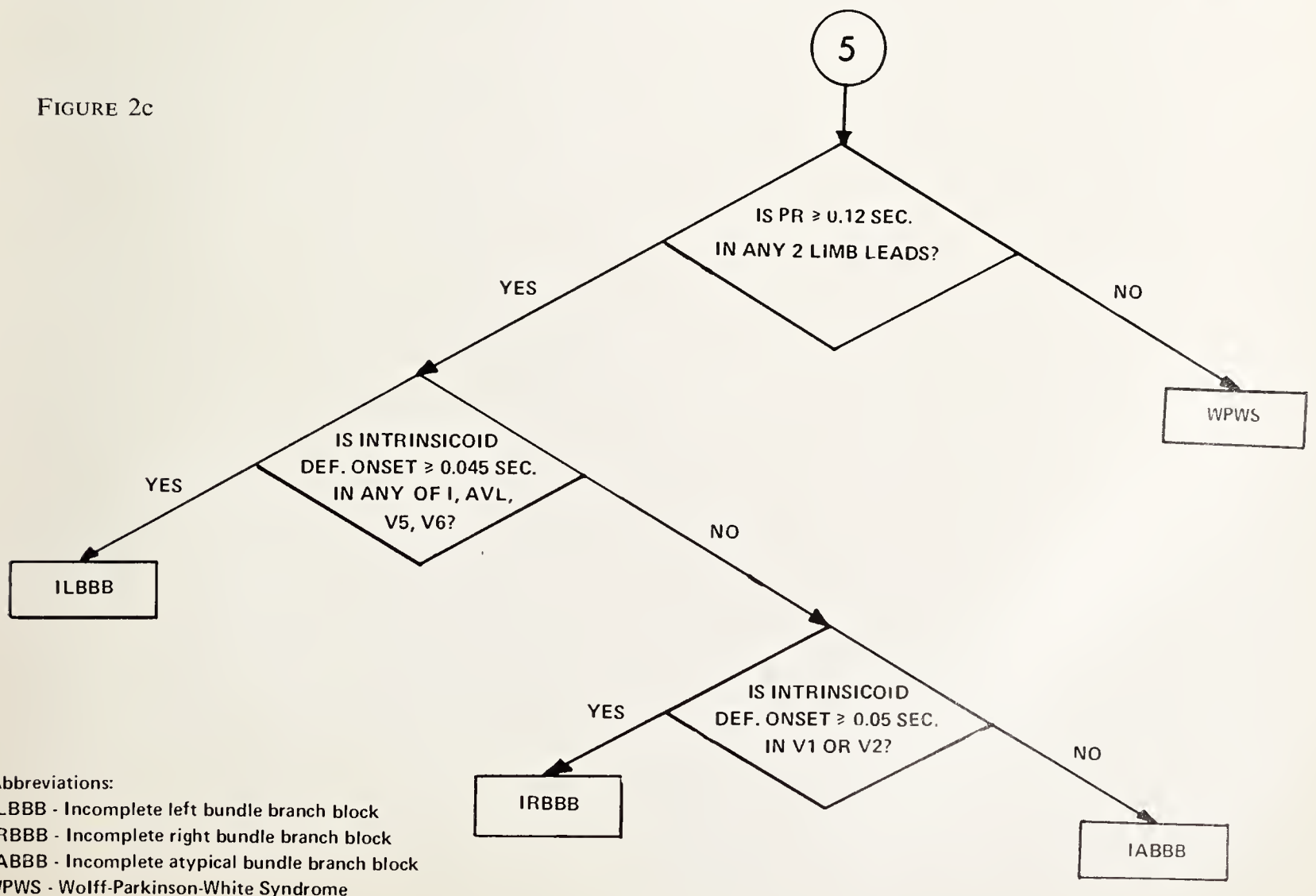


Figure 2a demonstrates how the logical tree is constructed for the preliminary evaluation of the ECG. In figure 2b the logical tree for a regular rhythm group with the heart rate between 60 and 100 is shown. The top node of this tree tests whether or not QRS duration in any two limb leads is greater than or equal to 0.12 sec. If the answer is "yes" then the next node contains the question "Is the PR interval greater than or equal to 0.12 sec.?" The positive answer to this question leads to the node which asks whether or not R peak time in any of L1, AVL, V5, V6 leads is greater than or equal to 0.06 sec. The positive answer to this question leads to the diagnosis of complete left bundle branch block. The negative answer leads to the question of whether or not R peak time in lead V1 or V2 is greater than or equal to 0.06 sec. The positive answer to this question leads to the diagnosis of complete right bundle branch block while the negative answer leads to the diagnosis of complete atypical bundle branch block.

Motivation for use of logical trees

In our experience in teaching electrocardiography we have found that students usually know a lot about the subject and still have many difficulties with arriving at the diagnosis. For example, they reply correctly to such questions as "Does this tracing have a pathological Q wave in lead aVF?", "What part of the ventricular wall is likely to be infarcted when the pathological Q wave in lead aVF is encountered?", etc. However, when a tracing is shown to medical students and they are asked to find by themselves what is abnormal, they usually fail.

These facts mean that the troublesome thing in learning electrocardiography by students is not memorization of data but the interpretation logic. In other words, students possess the knowledge of electrocardiography but do not have the ability to apply this knowledge.

Consequently, it seems necessary to teach medical students, not only about abnormal findings in the ECG but also about methods of their evaluation.

The advantage of using the logical tree is that it presents a step-by-step procedure for carrying out the evaluation of the electrocardiogram without the necessity of checking all ECG items. For example, the Wolff-Parkinson-White syndrome may be diagnosed according to the tree from Figure 2b by evaluating only two or three ECG items, namely: QRS complex greater than or equal to 0.12 sec., QRS complex greater than or equal to 0.10 sec., and PR interval greater than or equal to 0.12 sec.

Logical trees are not unique and many different trees may be constructed. An entirely different tree than this in Figure 2 would result if another sequence of tests were used. The problem naturally is to construct a tree with the number of tests reduced to a minimum.

Logical methods that have been discussed here using the example of electrocardiography can of course be used to evaluate any medical data. They seem to be the simplest and easiest means of improving the learning of clinical diagnosis.

SUMMARY

A method of evaluating medical data in order to arrive at diagnosis is presented. This method employs a series of questions and answers arrayed in a tree-like structure. Every question-node has two answer-branches, YES and NO, which lead to other questions. Final answers are terminated by diagnostic statements. This method not only aids the physician to evaluate medical data in the most efficient and prompt way but may also be utilized for a computer program simulating the diagnostic process.

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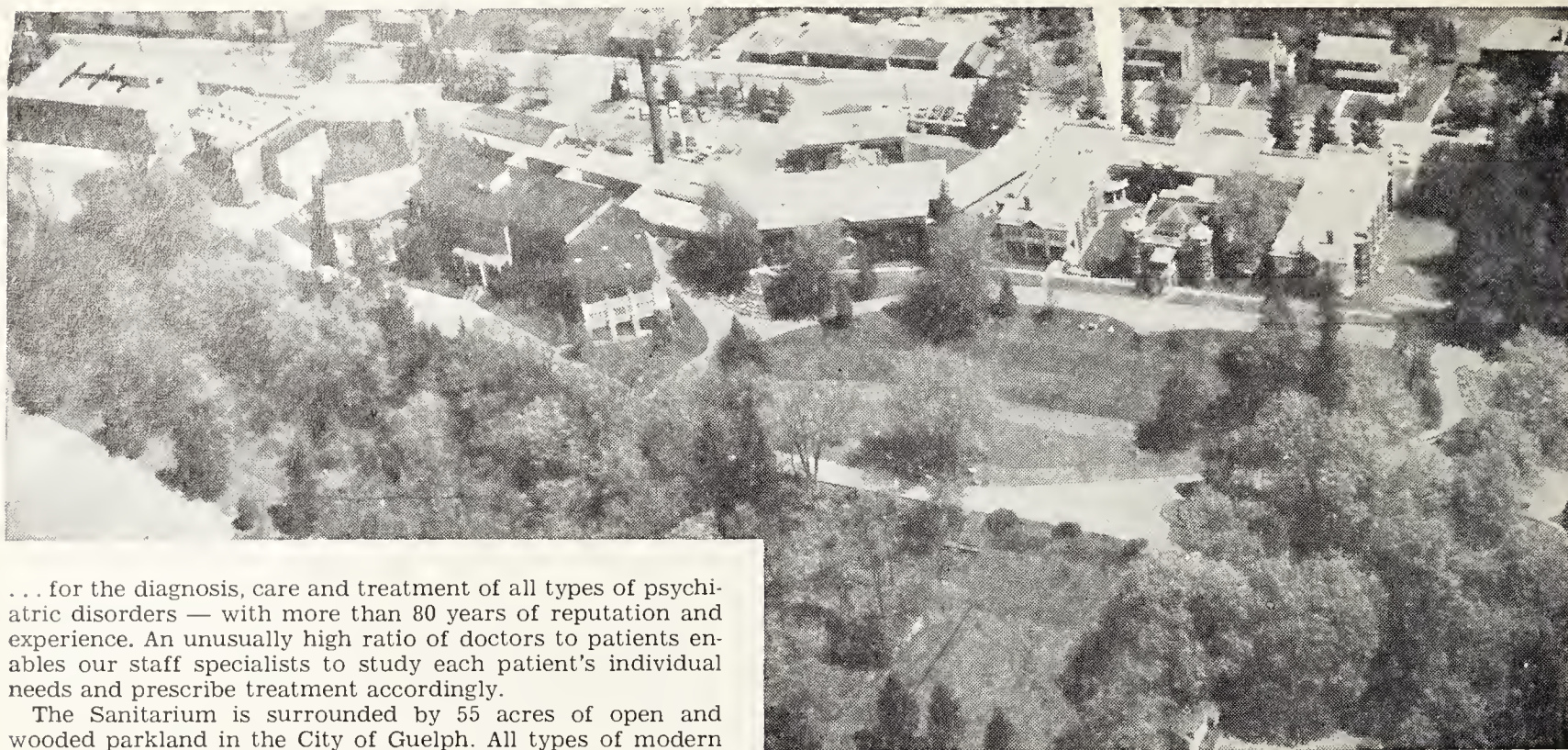
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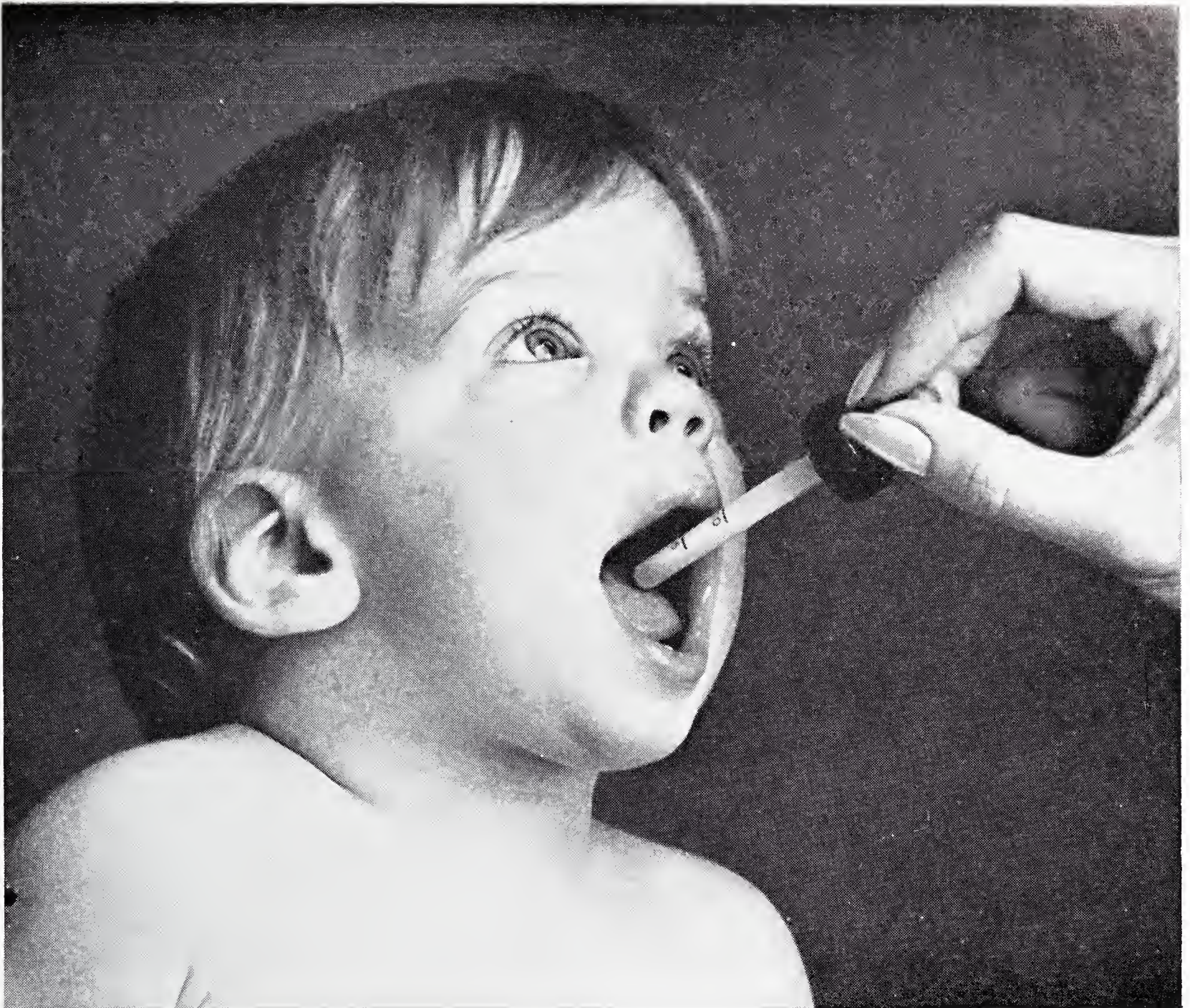
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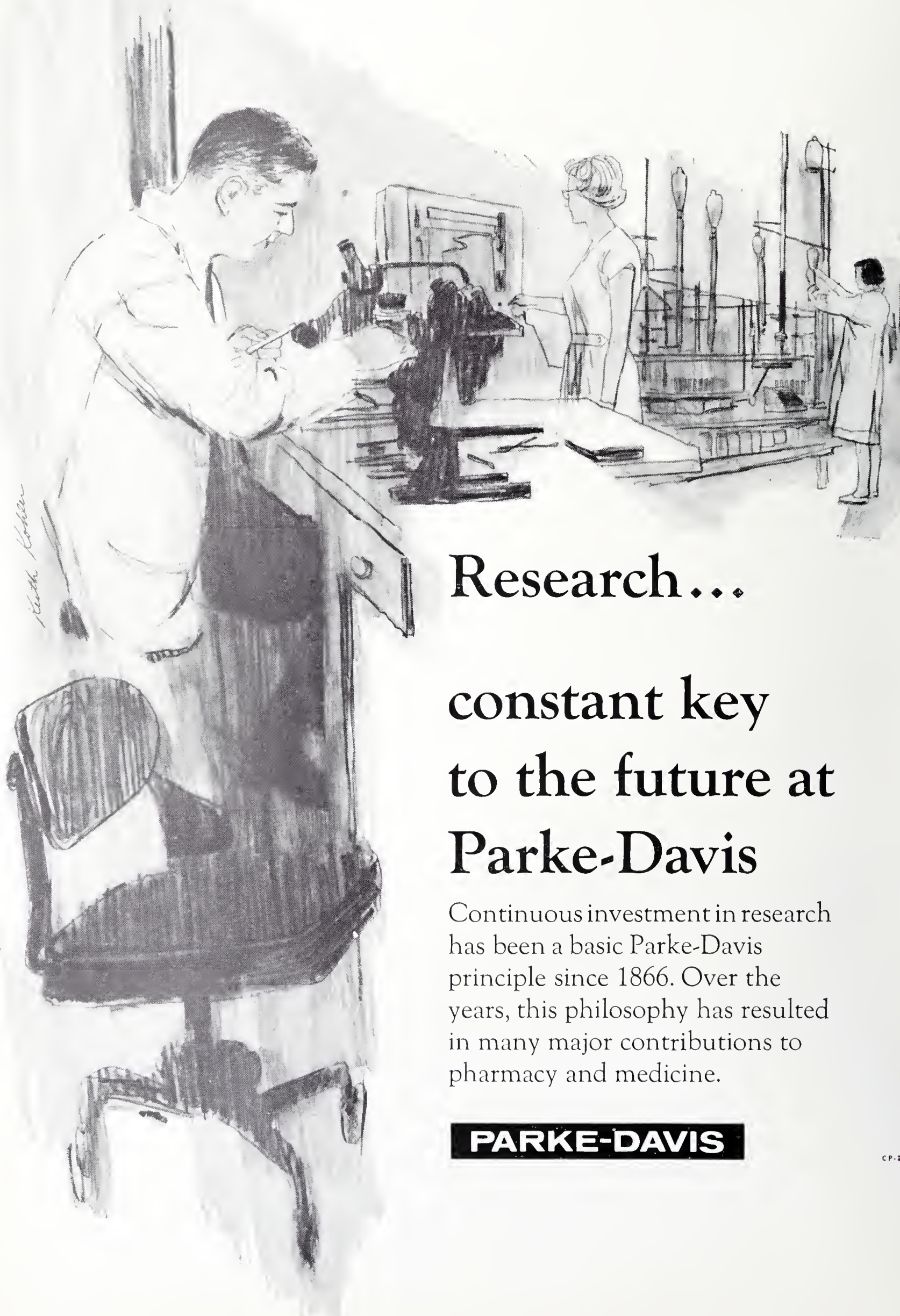
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